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Terrestrial isopods (Crustacea: Isopoda) from the Caucasus region. 5. *Cylisticus* Schnitzler, *Parcylisticus* Verhoeff, *Cylisticoides* n. gen.

Helmut Schmalfuss

Abstract

A list of the *Cylisticus* species known from the Caucasus region is given. For *C. giljarovi* and *C. iners* new collecting localities are recorded. Diagnostic characters of *C. birsteini* and *C. giljarovi* are figured. *Parcylisticus* is diagnosed and considered a full genus, and it may be the sister group of *Cylisticus*. *Parcylisticus mrovdaghensis* and *P. zangezuricus* are redescribed, their diagnostic characters are figured, and new collecting localities are recorded. *Parcylisticus angelikae* **n. sp.** from northeastern Turkey, *P. georgianus* **n. sp.** from Georgia and *P. golovatchi* **n. sp.** from southeastern Armenia are described and figured. *Cylisticoides* **n. gen.** is diagnosed and *Cylisticoides angulatus* **n. sp.** is described and figured from southeastern Azerbaijan. Distribution maps of all treated species are added.
Keywords: Isopoda, Oniscidea, Caucasus region, new species.

Zusammenfassung

Die aus dem Kaukasus-Gebiet bekannten *Cylisticus*-Arten werden aufgelistet. Für *C. giljarovi* und *C. iners* werden neue Fundorte mitgeteilt. Diagnostische Merkmale von *C. birsteini* und *C. giljarovi* werden abgebildet. *Parcylisticus* wird diagnostiziert und als eigenständige Gattung betrachtet, die möglicherweise die Schwestergruppe von *Cylisticus* ist. *Parcylisticus mrovdaghensis* und *P. zangezuricus* werden nachbeschrieben, ihre diagnostischen Merkmale werden abgebildet und neue Fundorte werden angegeben. *Parcylisticus angelikae* **n. sp.** aus der nordöstlichen Türkei, *P. georgianus* **n. sp.** aus Georgien und *P. golovatchi* **n. sp.** aus Südost-Armenien werden beschrieben und abgebildet. *Cylisticoides* **n. gen.** wird diagnostiziert und *Cylisticoides angulatus* **n. sp.** wird aus Südost-Aserbaidschan beschrieben und abgebildet. Die Fundorte aller behandelten Arten sind auf Karten dargestellt.

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1 Introduction

During the 1980s Dr. S. GOLOVATCH (Moscow) visited the Caucasus region on a number of collecting missions, concentrating on terrestrial arthropods. He entrusted me with the survey and hopefully the identification of the numerous samples of terrestrial isopods collected on these occasions. Many species described from that region can only be identified by direct comparison with the type material because of deficient descriptions. Thus the publication of the material could only be achieved step by step. In four papers (SCHMALFUSS 1987, 1989, 1990, 1992) I have treated three species of *Cylisticus* and the families Porcellionidae, Armadillidae and Armadillididae. In the present paper a survey is given of all Caucasian species of *Cylisticus*, with new records and redescriptions of some species, the genus *Parcylisticus* is revised, with redescriptions and new records of two species and descriptions of three new species, and the new genus *Cylisticoides* and the new species *C. angulatus* are described.

I do not subsume the three treated genera under the family name Cylisticidae for the following reasons:

– The family Cylisticidae is exclusively based on the traditional but wrong notion that the conglobation ability is a family character. This character can be present or missing in species of the same genus (e. g. *Porcellium*, compare SCHMALFUSS 1996). Otherwise there are no differences towards other members of the Trachelipodidae complex which, however, is probably a polyphyletic assemblage. Future research must be directed to recognise monophyletic entities inside this group and to find out their phylogenetic relations.

– There is a high probability that *Cylisticus* and *Parcylisticus* are closely related, but the similarity of *Cylisticoides* with these genera may be due to convergence.

Acronyms

SMF Senckenberg-Museum Frankfurt/Main
SMNS Staatliches Museum für Naturkunde Stuttgart, followed by the isopod collection number
ZMM Zoological Museum of the Lomonosov University Moscow

Acknowledgements

Thanks are due to Dr. S. GOLOVATCH (Moscow) for the possibility to investigate isopod material collected by him and his companions in the Caucasus, and to Dr. W. SCHAWALLER (SMNS) for isopod material collected in Azerbaidjan.

2 *Cylisticus* Schnitzler, 1853

2.1 Diagnose of the genus

The genus *Cylisticus* consists of an eastern group (eastern Europe, Turkey, Caucasus region, Elburs Mountains in northern Iran) and a (disjunct) western group (southern France, northern Italy, Corsica, Sardinia). The relationships between these two groups are not clear. Some derived characters of the eastern group (e. g. several long medial setae on male ischium VII) are not present in the western group, but there are no common derived characters for the western group. So for the time being it is not possible to list unequivocal diagnostic characters of the genus which are present in all species except the ability to conglobate, which is a character prone to convergence. One conspicuous derived character is a sexual dimorphism in the pereiopod VI (not VII!): In the male the medial side of the basipodite is concave and bears a brush of setae (see SCHMALFUSS 1992: 13, figs. 31–32). This character is present in the epigean, pigmented species of the eastern and western group, while it is (perhaps secondarily) lacking in the smaller, endogean unpigmented species of the western group.

The following species are known from the Caucasus region:

1. *C. birsteini* Borutzky, 1961 (see chapter 2.2.1)
2. *C. caucasius* Verhoeff, 1917 (see SCHMALFUSS 1987)
3. *C. giljarovi* Borutzky, 1977 (see chapter 2.2.2)
4. *C. iners* Budde-Lund, 1880 (syn.: *C. montivagus* Verhoeff, 1949, *C. korcagini* Borutzky, 1961; see SCHMALFUSS 1992 and chapter 2.2.3)
5. *C. lencoranensis* Borutzky, 1977 (see BORUTZKY 1977)
6. *C. mitis* Budde-Lund, 1885 (see BORUTZKY 1961)
7. *C. silvestris* Borutzky, 1957 (see BORUTZKY 1957, 1972b)
8. *C. strouhali* Borutzky, 1977 (see BORUTZKY 1977)

Cylisticus dentifrons Budde-Lund, 1885 (syn.: *C. ciscaucasius* Borutzky, 1961, see SCHMALFUSS 1989) is here ascribed to the genus *Parcylisticus* (see chapter 3.1).

2.2 Investigated species

2.2.1 *Cylisticus birsteini* Borutzky, 1961 (Figs. 1–3 and map Fig. 4)

Cylisticus birsteini: BORUTZKY (1961: 35, fig. 5; 8figs.); BORUTZKY (1972a: 33); BORUTZKY (1972b: 200).

Material examined

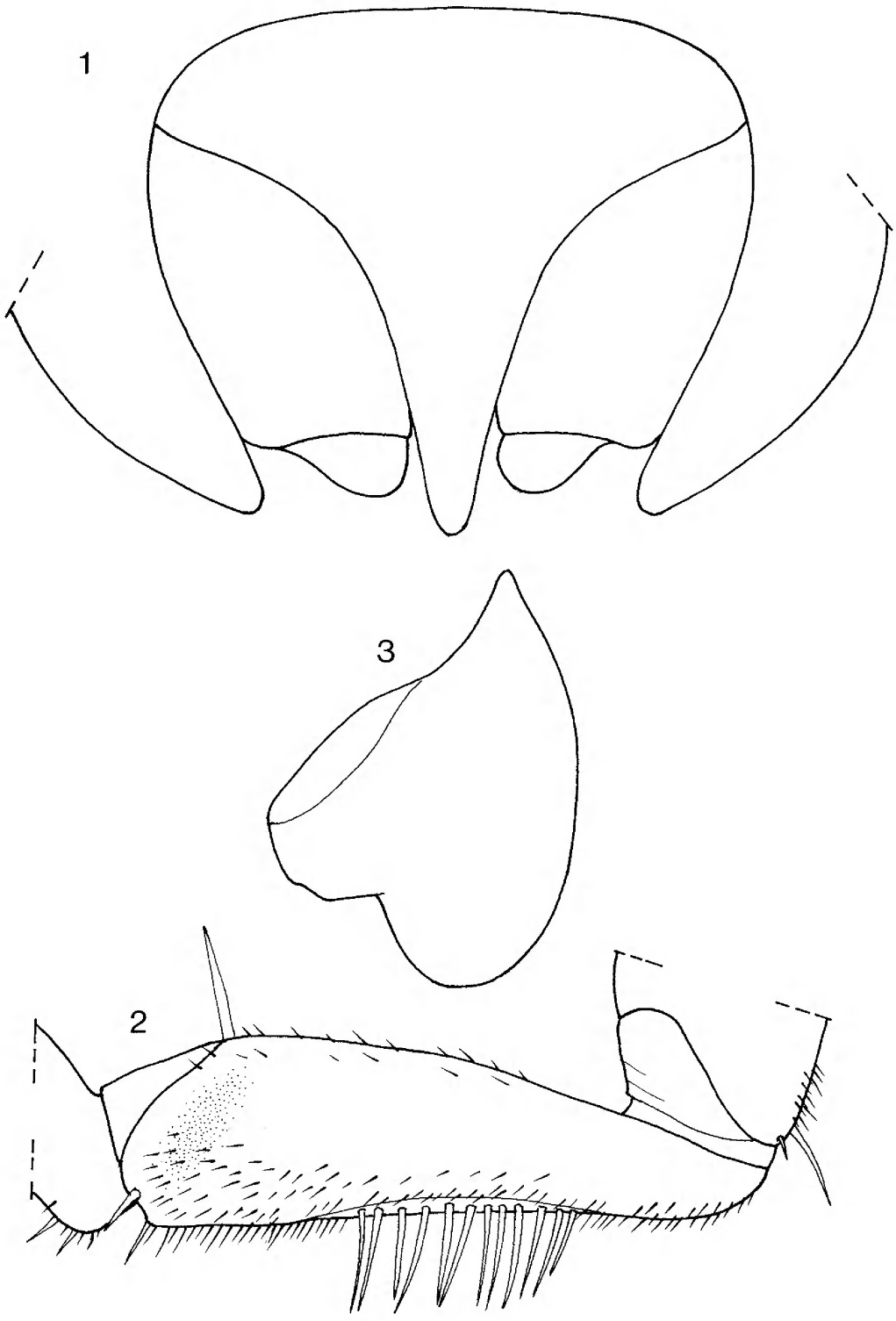
1 ♂, holotype, 10 mm long, Russia, NW-Caucasus, Krasnodar Territory, near Khosta, "Mokraya" Cave, leg. J. A. BIRSTEIN, 23.XII.1940 (ZMM).

Further records

Russia, Krasnodar Territory, cave at river Psakho which is a tributary to the river Kudepsta (BORUTZKY 1972a).

Distribution

This species is known from two caves in the Krasnodar Territory (map Fig. 4).



Figs. 1–3. *Cylisticus birsteini*, ♂, holotype, 10 mm long (ZMM). – **1**. Telson and uropod-protopodites (exopodite missing). **2**. Pleopod-exopodite I. **3**. Ischium VII.

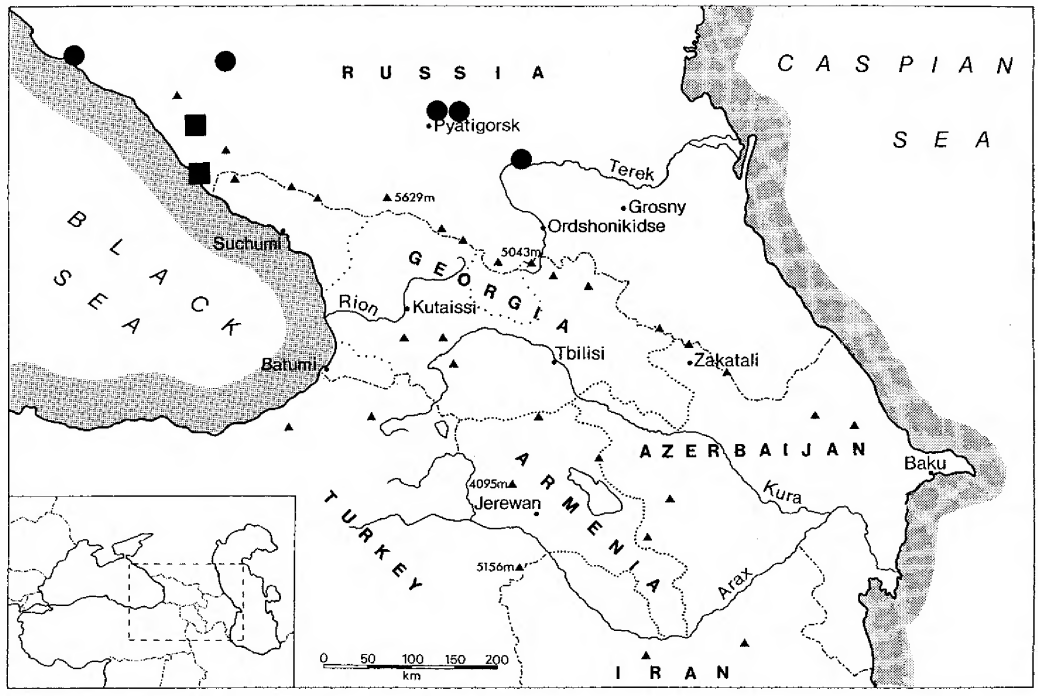


Fig. 4. Records of *Cylisticus birsteini* (■) and *C. giljarovi* (●).

Differential diagnosis

The species differs from *C. giljarovi*, which is known from the same region, by the shape of the male ischium VII (Fig. 2), the male pleopod-exopodite I (Fig. 3) and of the pleon-epimera V (Fig. 1, much narrower in *C. giljarovi*, see Fig. 7).

2.2.2 *Cylisticus giljarovi* Borutzky, 1977
(Figs. 5–10 and map Fig. 4)

Cylisticus giljarovi: Borutzky (1977: 30, figs. 2.1–2.7).

Material examined

10 specimens, Russia, N Caucasus, Krasnodar Territory, W of Maikop, 300 m, *Fagus-Quercus* forest, litter, leg. S. Golovatch, 8.VII.1986 (SMNS 13070). – 9 specimens, Russia, N Caucasus, Stavropol Territory, E of Georgievsk, forest of *Quercus*, *Carpinus* etc., litter and under bark, leg. Golovatch, 28.–31.V.1982 (ZMM). – 5 specimens, Russia, N Osetia, 10 km NW of Mozdok, *Acacia* hedge, leg. Golovatch, 28.V.1982 (ZMM). – 5 specimens, Russia, N Caucasus, Stavropol Territory, 3 km E of Zheleznovodsk, forest of *Carpinus*, *Acer*, *Fraxinus* along a stream, litter and under stones, leg. Golovatch, 30.V.1982 (ZMM). – 12 specimens, Russia, N Caucasus, Stavropol Territory, E of Georgievsk, in park of a sanatorium, litter, under stones, on wall, leg. Golovatch, 1.VI.1982 (ZMM).

Further records

Russia, Krasnodar Territory, around Gelendjik close to the coast of the Black Sea (type material, Borutzky 1977).

Distribution

Russia, northern foothills of the Caucasus from Krasnodar Territory to the upper Terek river (map Fig. 4). Obviously a lowland species living in deciduous forest.

Diagnostic characters

Maximum dimensions: ♀ 15 mm, ♂ 13 mm length.

Coloration: Uniform bluish grey (not mottled as *C. caucasius*), with epimera lighter.

Head with usual medial frontal process slightly shorter than side-lobes (Fig. 5). Pereion-tergite IV with nodulus lateralis twice as far from lateral margin than in tergite III (Fig. 6). Epimera of pleon, especially of pleonite V, extremely narrow with sharply pointed apex and strongly convergent (Fig. 7). Telson broader than long (length:width 4:5), with strongly concave rounded sides and sharply pointed apex (Fig. 7).

Male ischium VII shorter and stouter than in *birsteini*, ventrally (= medially) with a row of about 12 long and spiny setae and a ventral-distal hairy brush and two long spiny setae (Fig. 8). Male pleopod-exopodite I with triangular pointed hind-lobe (Fig. 9), endopodite I apically curved outwards at a right angle (Fig. 10). Uropod-exopodites narrow and shorter than telson (Fig. 7).

2.2.3 *Cylisticus iners* Budde-Lund, 1880
(see map Fig. 11)

Material examined

12 specimens, NE-Turkey, 35 km E Artvin, E Ardanuç, 1700 m, forest of *Picea orientalis*, leg. SCHMALFUSS, 22. VII.2001 (SMNS 11515). – 8 specimens, NE-Turkey, 45 km SW Kars, *Pinus* forest, leg. SCHMALFUSS, 30. VII.2001 (SMNS 11517).

Remarks

The new samples show that the species occurs not only in deciduous but also in pure coniferous forest. All records of this species are mapped in Fig. 11.

For bibliography, synonyms, figures of diagnostic characters, SEM photographs of all seven male pereiopods and remarks on distribution, ecology and phylogeny see SCHMALFUSS (1992: 1–17, figs. 1–36).

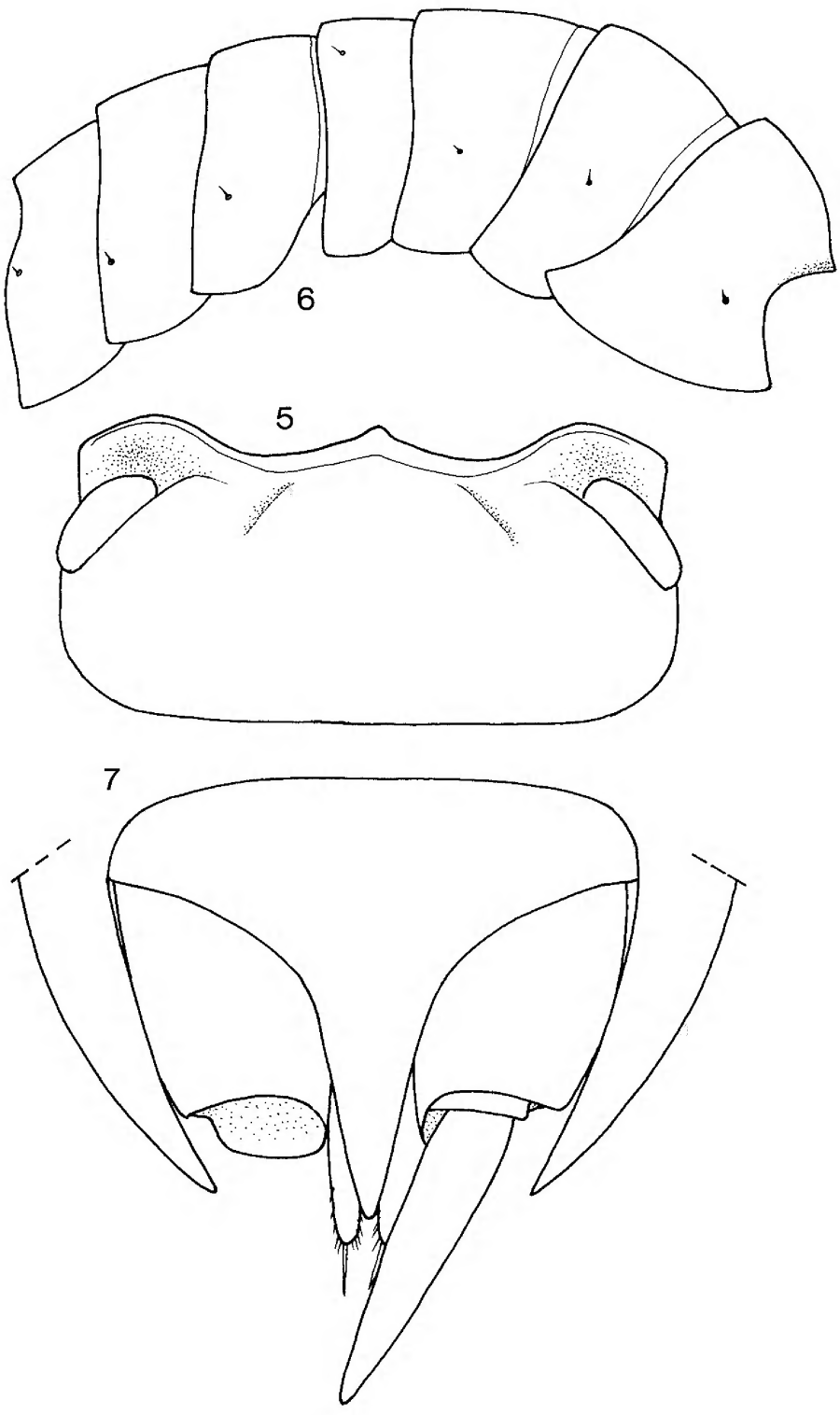
3 *Parcylisticus* Verhoeff, 1943

3.1 Diagnose of the genus

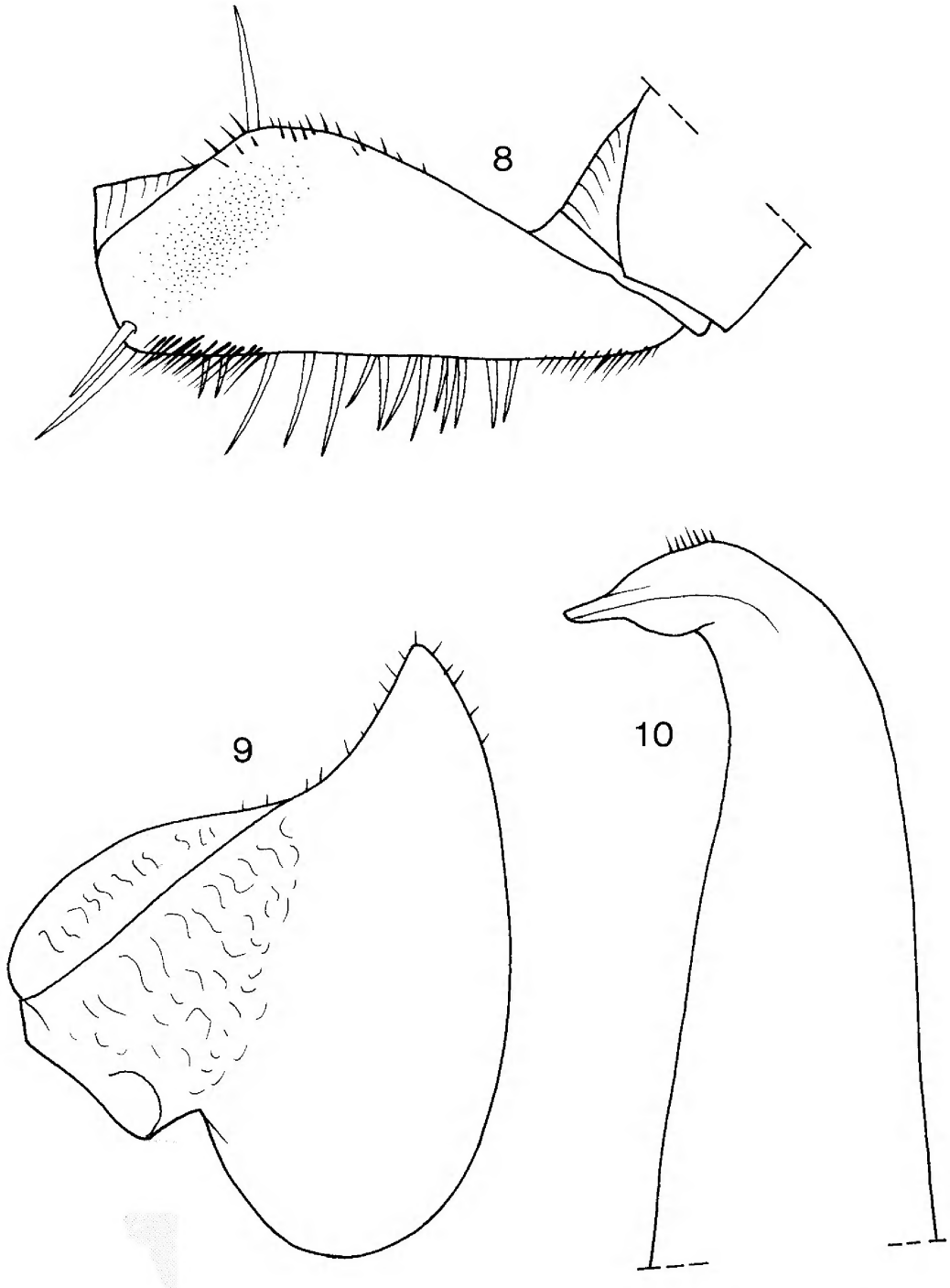
Type-species: *Parcylisticus pugionifer* Verhoeff, 1943 from eastern Turkey.

The diagnostic characters of this genus, separating it from *Cylisticus*, are:

- All tergites with tubercles.
- Apex of male pleopod-endopodite I straight, not curved outwards as in *Cylisticus*.
- Uropod-exopodites sexually dimorphic, considerably bigger in male.
- Basipodite of male pereiopod VI without any sexual modification (in contrast to *Cylisticus*, see figs. for *C. iners* in SCHMALFUSS 1992).



Figs. 5–7. *Cylisticus giljarovi*, ♀ with marsupium, 15 mm long, W Maikop (SMNS 13070). – **5**. Lateral view of pereion. **6**. Head in dorsal view. **7**. Telson and uropods in situ.



Figs. 8–10. *Cylisticus giljarovi*, ♂, 11 mm long, W Maikop (SMNS 13070). – **8.** Ischium VII. **9.** Pleopod-exopodite I. **10.** Apex of pleopod-endopodite I.

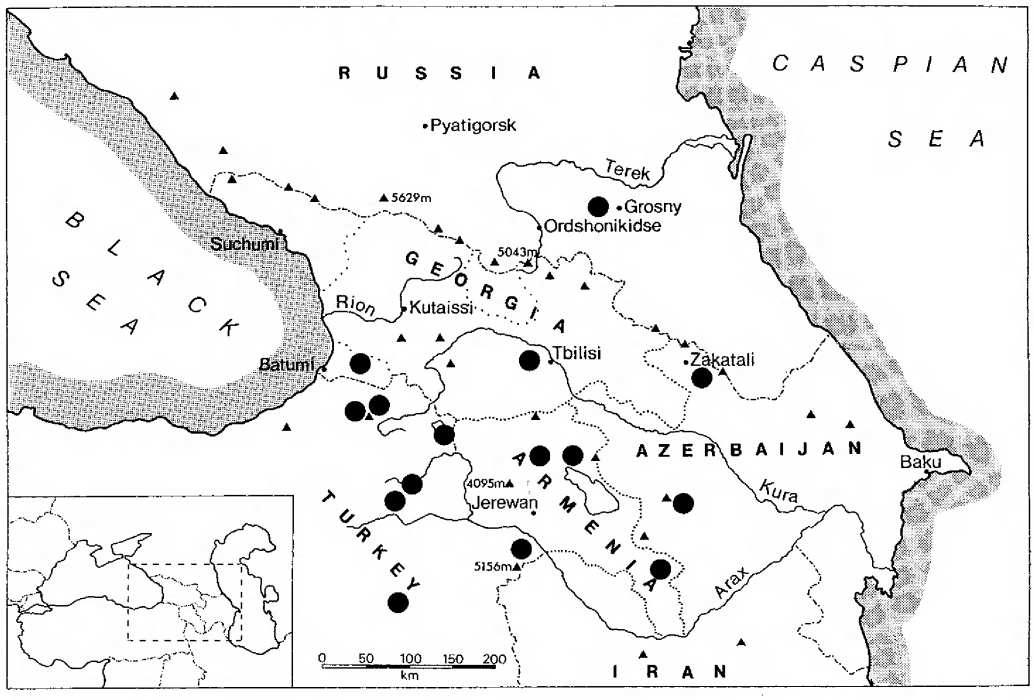


Fig. 11. Records of *Cylisticus iners* (●).

The noduli laterales IV and VII are eccentric as in *Cylisticus.*

If *Cylisticus* can be proved a monophyletic taxon – which is not yet clarified (see chapter 1) – *Parcylisticus* would have to be considered as its sister-group.

VERHOEFF (1949) has described a second species *P. nivicomes* from the Erciyas Dağı S Kayseri in central Turkey. STROUHAL (1953) erected a new subspecies *P. pugionifer kopdaghensis* from northeastern Turkey. BORUTZKY (1970) considered *Parcylisticus* a subgenus of *Cylisticus* and described the species *armenicus*, *urartuensis*, *zangezuricus* from Armenia and *mrovdaghensis* from Azerbaijan. Finally I have described the subspecies *P. pugionifer syriacus* from the Eufrates river in northern Syria and southern Turkey (SCHMALFUSS 1986b) which presently I treat as separate species. *P. nivicomes* is considered here as conspecific with *pugionifer* (compare discussion in Strouhal 1953: 368ff.). The species *Cylisticus dentifrons* Budde-Lund, 1885 from the northern Caucasus region (redescription see SCHMALFUSS 1989) has all diagnostic characters of *Parcylisticus* and thus is transferred to this genus. In the present paper material is recorded which can be ascribed to *P. zangezuricus* and *mrovdaghensis*; further systematic small-scale collections must show whether all four species described by BORUTZKY from Armenia and Azerbaijan are separate species. Three other forms from the Caucasus region are considered as specifically distinct and described as new.

List of the valid species of *Parcylisticus*:

1. *P. angelikae* n. sp. (see chapter 3.2.1)
2. *P. armenicus* (Borutzky, 1970) (syn.: *Cylisticus a.*, see BORUTZKY 1970, 1972b)
3. *P. dentifrons* (Budde-Lund, 1885) (syn.: *Cylisticus d.*, *Cylisticus ciscaucasius* Borutzky, 1961; see SCHMALFUSS 1989)

4. *P. georgianus* n. sp. (see chapter 3.2.2)
5. *P. golovatchi* n. sp. (see chapter 3.2.3)
6. *P. mrovdaghensis* (Borutzky, 1970) (syn.: *Cylisticus m.*, *P. mrovdaghicus*; see chapter 3.2.4)
7. *P. pugionifer* Verhoeff, 1943 (syn.: *Cylisticus p.*, *P. nivicomes* Verhoeff, 1949; see VERHOEFF 1943, 1949, STROUHAL 1953: 368ff., BORUTZKY 1970)
8. *P. syriacus* Schmalfuss, 1986 (syn.: *P. pugionifer s.*; see SCHMALFUSS 1986b)
9. *P. urartuensis* (Borutzky, 1970) (syn.: *Cylisticus u.*; see BORUTZKY 1970, 1972b)
10. *P. zangezuricus* (Borutzky, 1970) (syn.: *Cylisticus z.*; see chapter 3.2.5)

3.2 Investigated species

3.2.1 *Parcylisticus angelikae* n. sp.

(Figs. 12–21 and map Fig. 22)

Material examined

Holotype: ♂, 18.0 × 5.7 mm, NE-Turkey, Kaçkar Mountains, W Olgunlar, 2500–3000 m, alpine meadows, leg. SCHMALFUSS, 23. VII.2001 (SMNS T501).

Paratypes: 4 ♂♂, 4 ♀♀ without marsupium, same data as holotype (SMNS T502). – 1 ♂, 2 ♀♀ without marsupium, NE-Turkey, Kaçkar Mountains, S Yaylalar, 2400–3000 m, alpine meadows, leg. SCHMALFUSS, 25. VII.2001 (SMNS T503). – 16 ♂♂, 23 ♀♀ (19 with marsupium), NE-Turkey, 55 km S Rize, Tatos Mountains, 5 km SE Sivrikaya, 2400–2600 m, alpine meadows, leg. SCHMALFUSS, 21. VII.2001 (SMNS T505). – 1 ♂, 3 ♀♀ (one with marsupium), NE-Turkey, 70 km S Rize, 15 km S Sivrikaya, Ovitdağı Pass, 2700 m, alpine meadows, leg. SCHMALFUSS, 20. VII.2001 (SMNS T504).

Etymology

The species is dedicated to Dr. ANGELIKA RAUS (Berlin), who participated in the excursion which yielded this and other new species of terrestrial isopods. She provided medical help and psychological support to a number of participants of this excursion in a very unselfish way.

Distribution

Northeastern Turkey, Tatos Mountains and Kaçkar Mountains south and southeast of Rize. All samples were collected above the tree line on alpine meadows between 2400 and 3000 m.

Diagnostic characters

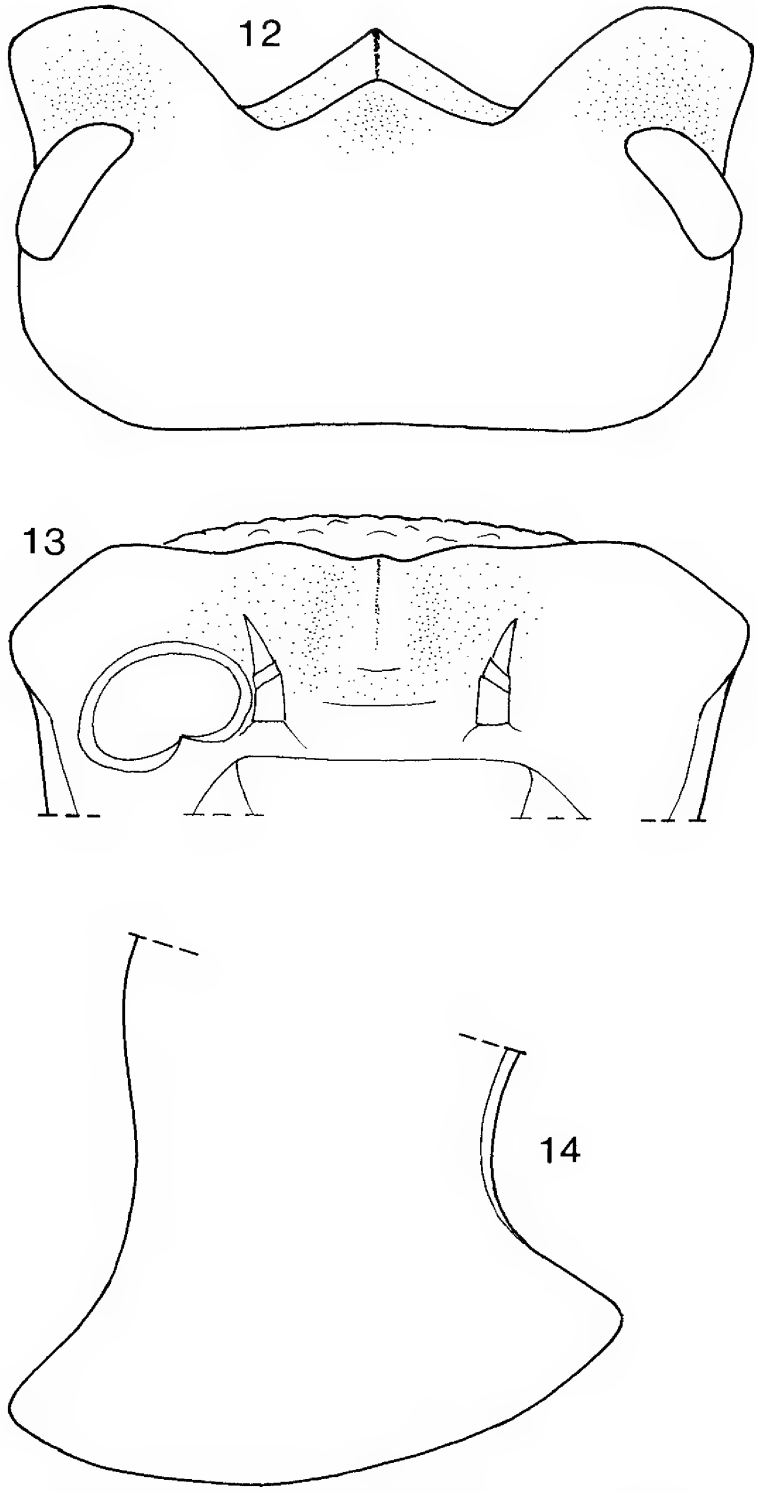
Dimensions: Largest male (holotype) 18 mm long, uropod-exopodite 3 mm long. All females with marsupium are between 9 and 10 mm long.

Coloration: Slate grey, some specimens with yellowish lateral margins of the epimera and hind margins of the tergites.

Cuticular structures: Tergal parts tuberculated, more pronounced tubercles on anterior tergites.

Head with pronounced quadrangular side-lobes whose lateral angles are pointing outwards (Fig. 12); median process not pointed upwards (Fig. 13). Pereion-epimera I with hind-margin rounded (Fig. 14). Pleon-epimera V with inner margin parallel or slightly converging (Figs. 15–17). Telson in males as wide as long (Figs. 15–16), in females shorter than wide (Fig. 17).

Basipodite of male pereiopod VI see Fig. 18, no sexual modifications (diagnostic character of the genus). Male ischium VII ventrally concave, without multiple long



Figs. 12–14. *Parcylisticus angelikae* n. sp., ♂, holotype, 18 mm long (SMNS T501). – **12**. Head in dorsal view. **13**. Head in frontal view. **14**. Pereion-epimeron I.

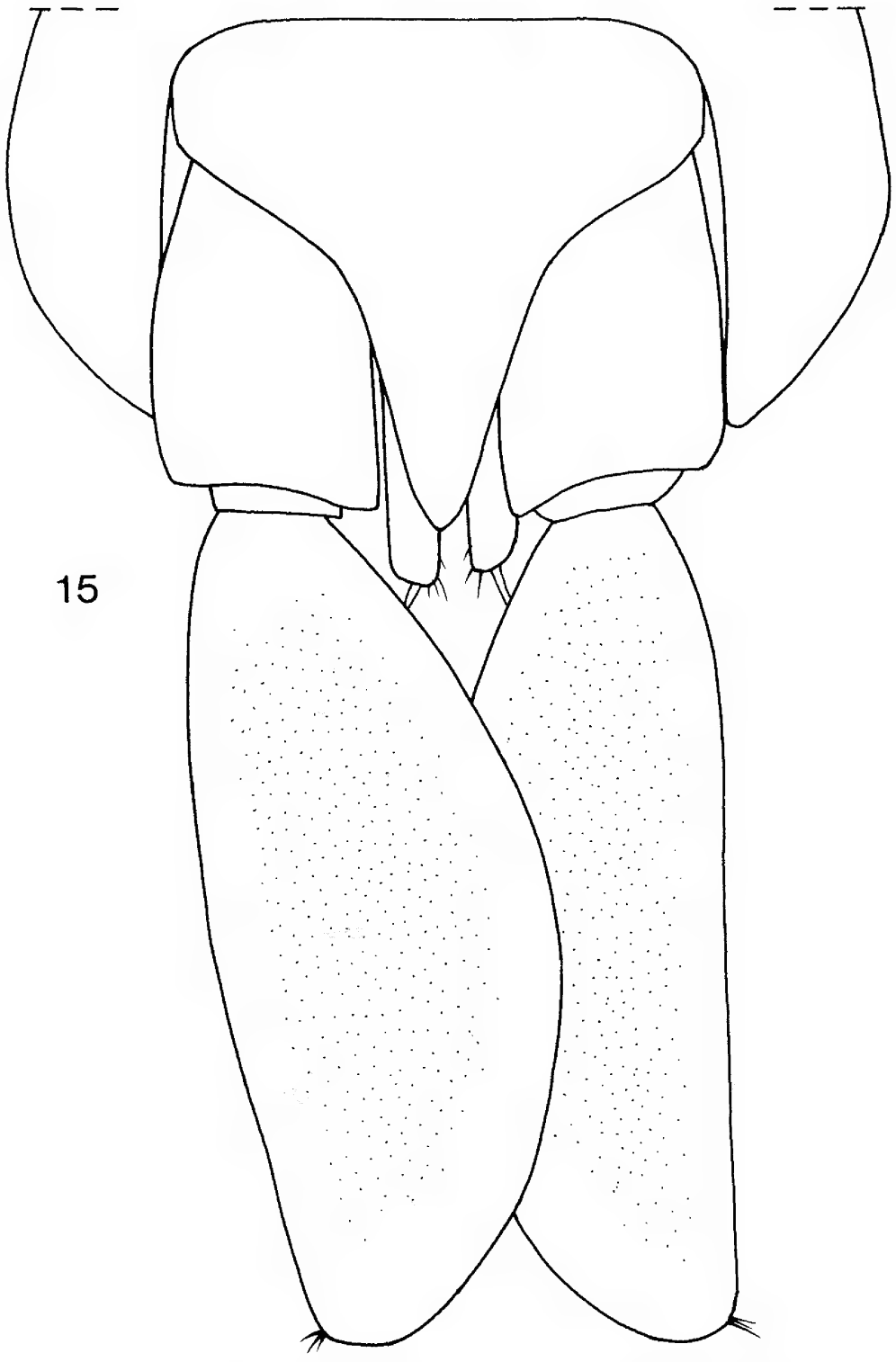
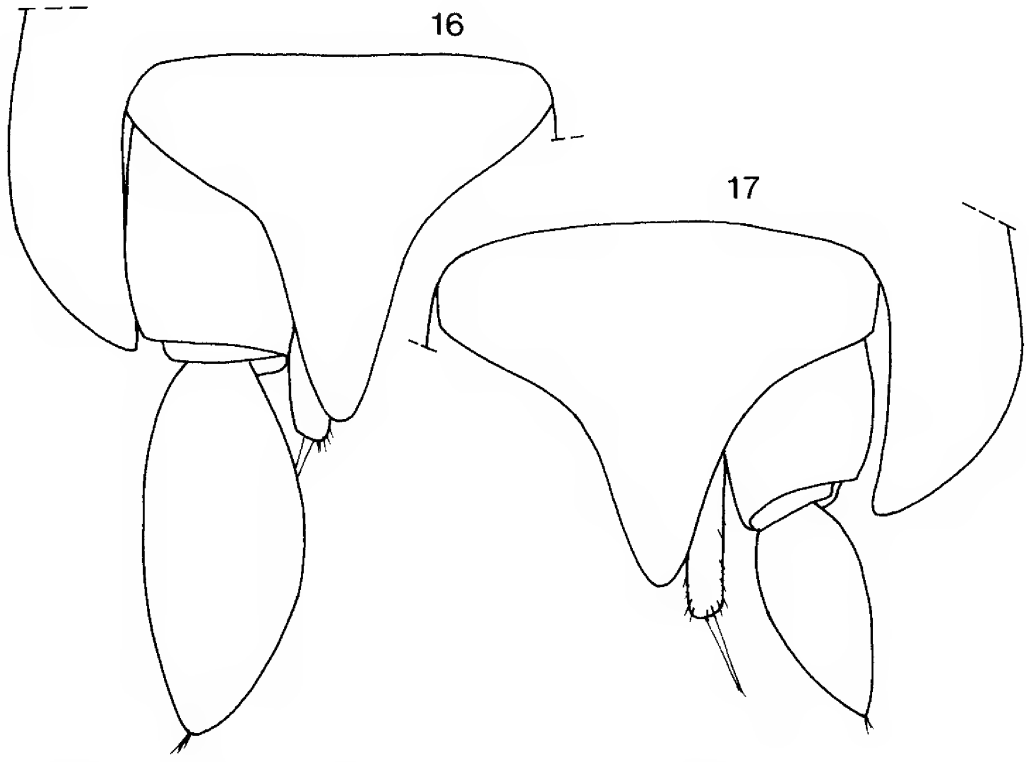


Fig. 15. *Parcylisticus angelikae* n. sp., ♂, holotype, 18 mm long (SMNS T501), telson and uropods in situ.

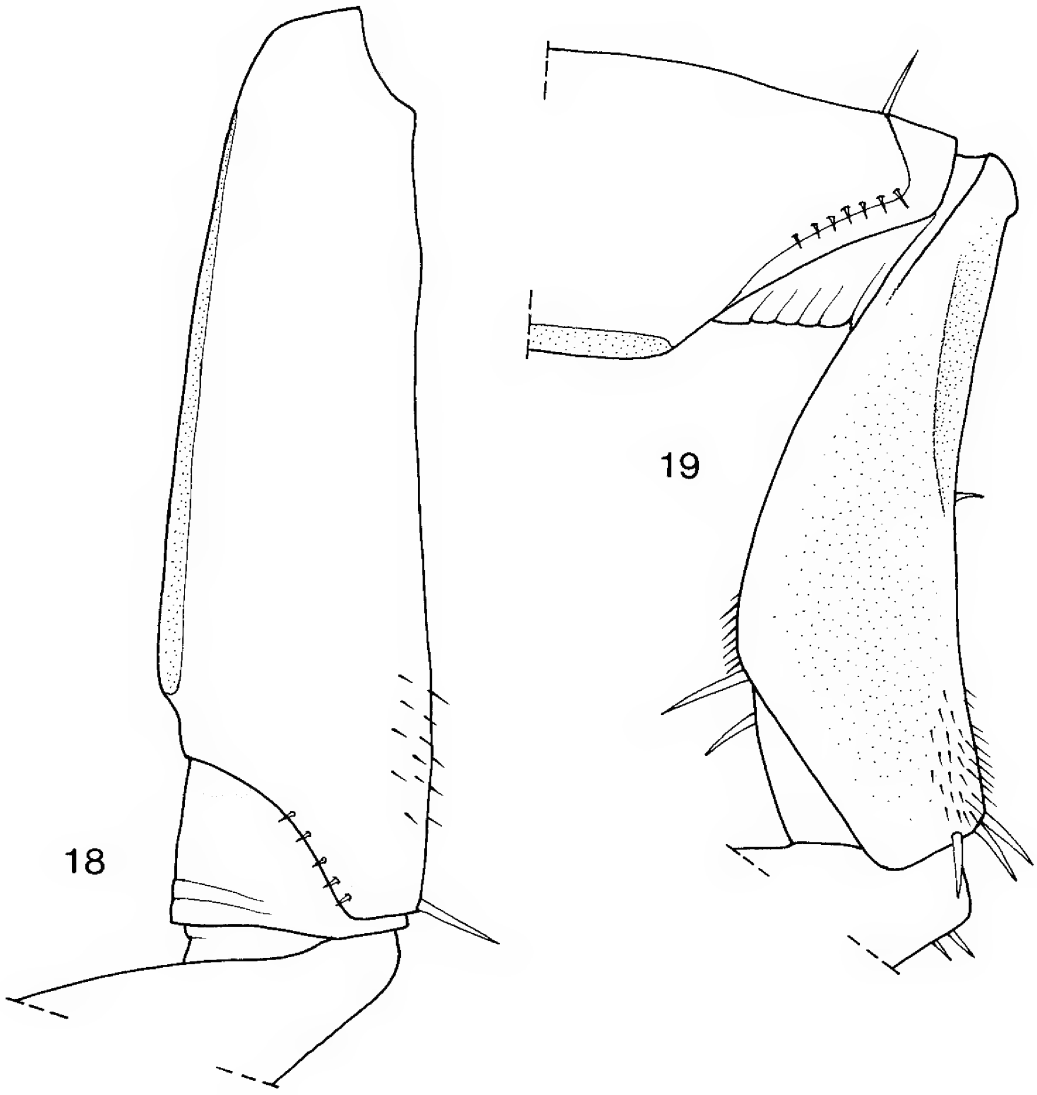


Figs. 16–17. *Parcylisticus angelikae* n. sp. – **16.** ♂, paratype, 13 mm long (SMNS T502), telson and uropod in situ. **17.** ♀ without marsupium, paratype, 11 mm long (SMNS T502), telson and uropod in situ.

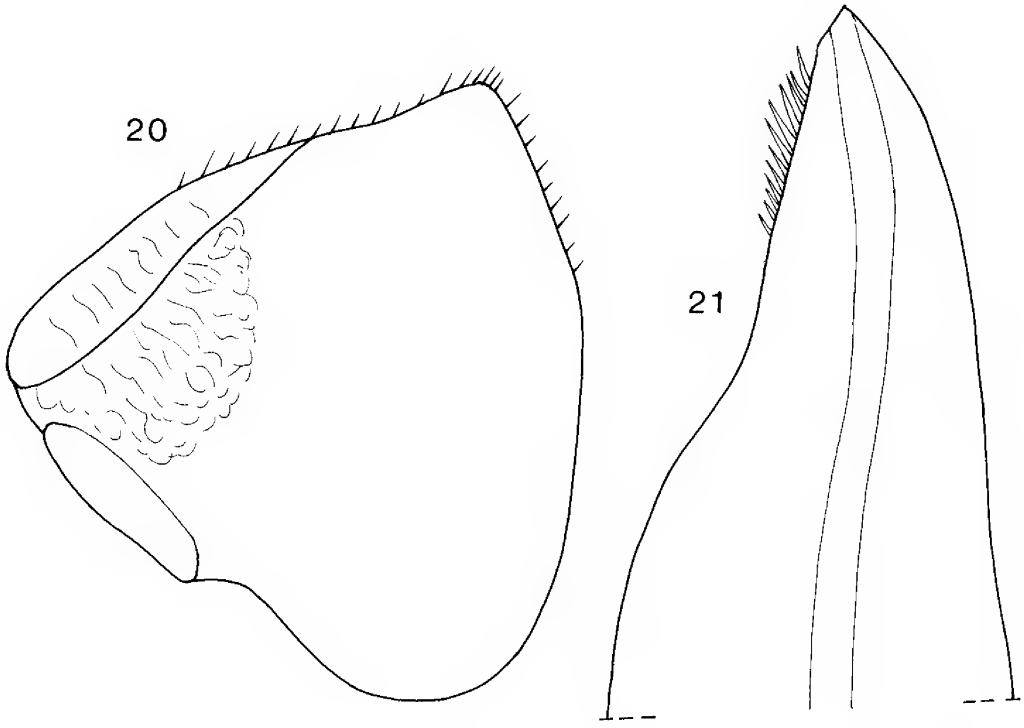
spines in the middle part, only distally with a group of setae (Fig. 19). Male pleopod-exopodite I without hind-lobe (Fig. 20), apex of endopodite I see Fig. 21. Male uropod-exopodite in large males extremely elongated (nearly twice as long as telson) and extremely widened on the medial side (Fig. 15); in smaller males the exopodite is much shorter (Fig. 16) and in females it is extremely short (Fig. 17).

Differential diagnosis

The new species differs from other species of the genus by the frontal median lobe not pointing upwards, the male pleopod-exopodite I without hind-lobe, and the male uropod-exopodites being extremely enlarged and much longer than telson.



Figs. 18–19. *Parcylisticus angelikae* n. sp., ♂, holotype, 18 mm long (SMNS T501). – **18.** Basipodite VI (no sexual modifications). **19.** Ischium VII.



Figs. 20–21. *Parcylisticus angelikae* n. sp., ♂, holotype, 18 mm long (SMNS T 501). – **20.** Pleopod-exopodite I. **21.** Apex of pleopod-endopodite I.

3.2.2 *Parcylisticus georgianus* **n. sp.**
(Figs. 23–29 and map Fig. 22)

Material examined

Holotype: ♂, 12.5 × 4.5 mm, Caucasus, SW-Georgia, 15 km W of Adigeni, 1500–1700 m, *Abies*, *Picea*, *Acer*, *Fagus* etc. forest, leg. GOLOVATCH, 14.–15.V.1983 (ZMM).

Paratypes: 2 ♂♂, 3 ♀♀, same data as holotype (1 ♂, 1 ♀: SMNS T482, 1 ♂, 2 ♀♀: ZMM). – 1 ♂, Caucasus, NW-Georgia, Mestia, 1500 m, *Betula* and *Rhododendron* on moraine, leg. GOLOVATCH, 5. and 16.IX.1986 (ZMM). – 1 ♂, 2 ♀ ♀, Caucasus, Georgia, near Kutaissi, pine wood, leg. O. MAKAROVA, 1.II.1987 (ZMM). – 1 ♀, Georgia/Adzharia, Batumi, Botanical Garden, 20–150 m, leg. GOLOVATCH & MARTENS, 30.V.–7.VI.1981 (ZMM).

Distribution

Western Georgia, Caucasus south of the main ridge.

Diagnostic characters

Maximum dimension: 12.5 mm length.

Coloration: Greyish brown, a medial row of light dots, margins of epimera without pigmentation.

Cuticular characters: Tergal parts with pronounced tubercles.

Head with rounded side-lobes, median upright lobe not surpassing side-lobes, in frontal view shorter than outline of head (Figs. 23–24). Pereion-epimera I with rounded concave hind margin, hind corner with acute angle (Fig. 25). Inner margin

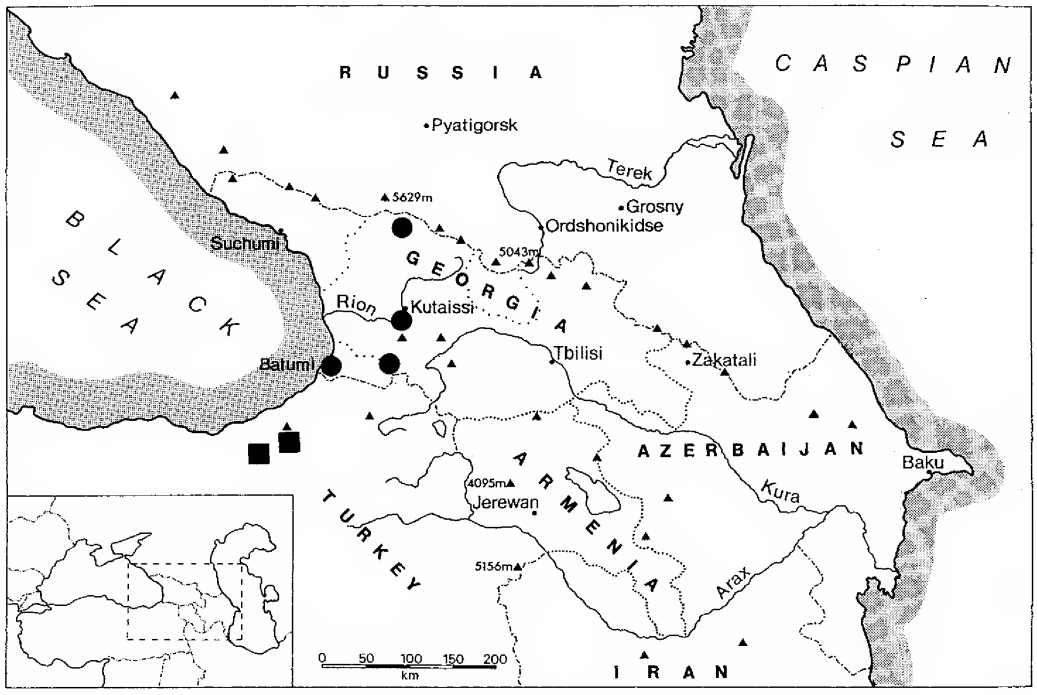


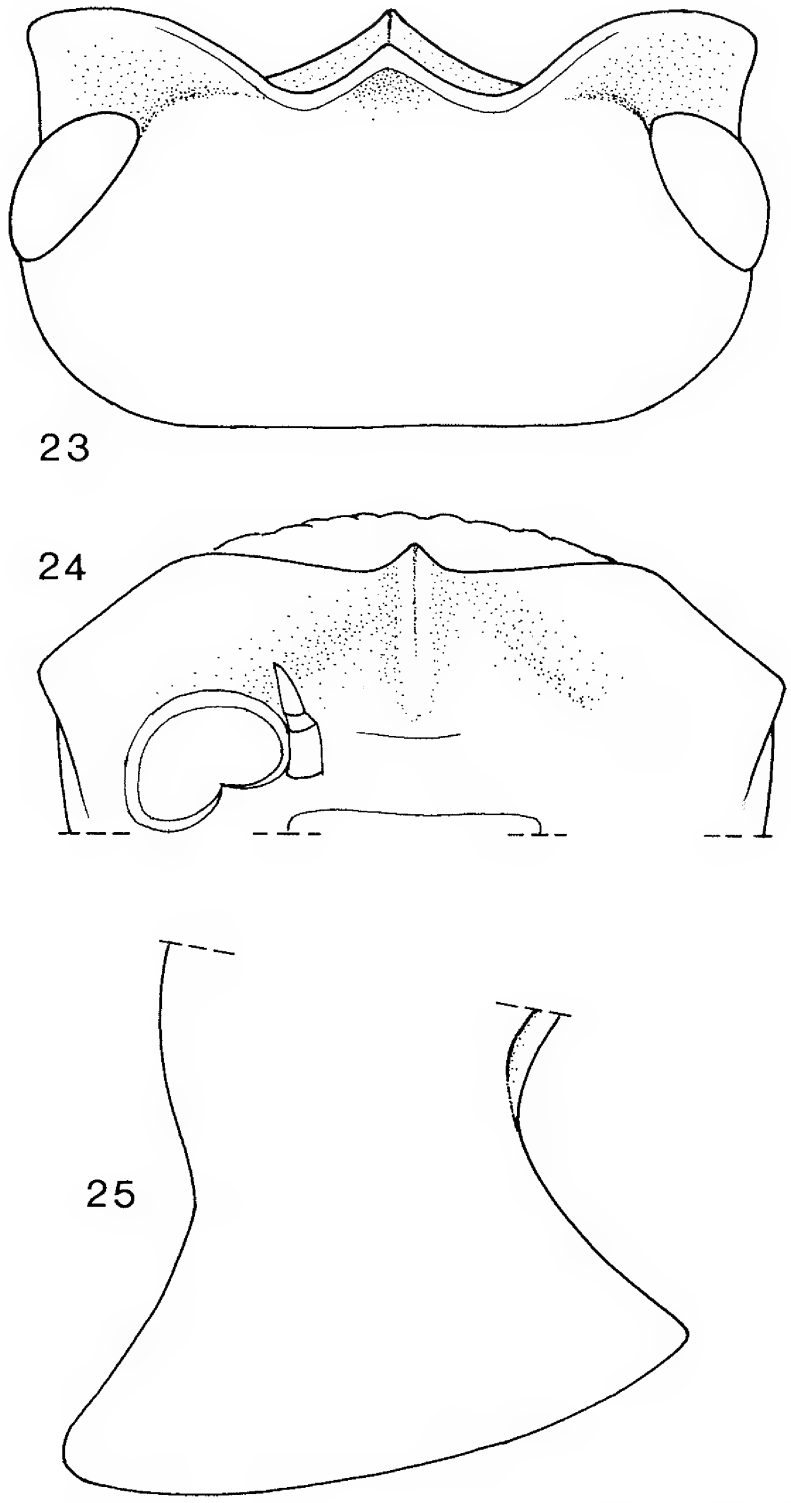
Fig. 22. Records of *Parcylisticus angelikae* n. sp. (■) and *P. georgianus* n. sp. (●).

of pleon-epimera V slightly diverging (Fig. 26). Telson wider than long, sides only slightly concave compared with the other species of the genus (Fig. 26).

Male ischium VII medially (ventrally) slightly concave, with short setation, but only one longer tactile seta in the middle (Fig. 27), and three long spiny setae mediodistally. Male pleopod-exopodite I triangular, hind corner not elongated, posterolateral margin straight (Fig. 27), apex of endopodite I see Fig. 28. Male uropod-exopodite flattened and slightly enlarged (Fig. 26), shorter than telson.

Differential diagnosis

The differences towards other species of the genus are the frontal median lobe pointing upwards, the male pleopod-exopodite I without hind-lobe, and the male uropod-exopodites being about as long as the telson.



Figs. 23–25. *Parcylisticus georgianus* n. sp., ♂, holotype, 12.5 mm long (ZMM). – **23.** Head in dorsal view. **24.** Head in frontal view. **25.** Pereion-epimeron I.

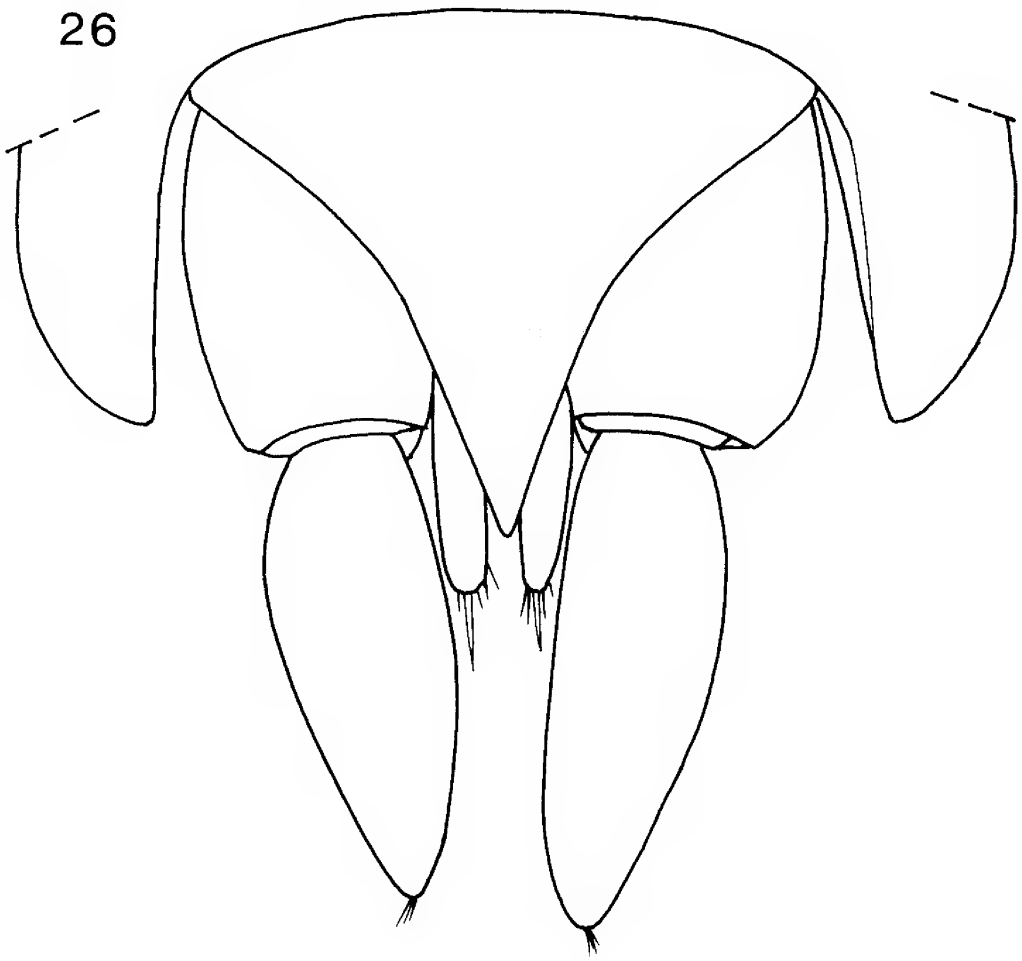
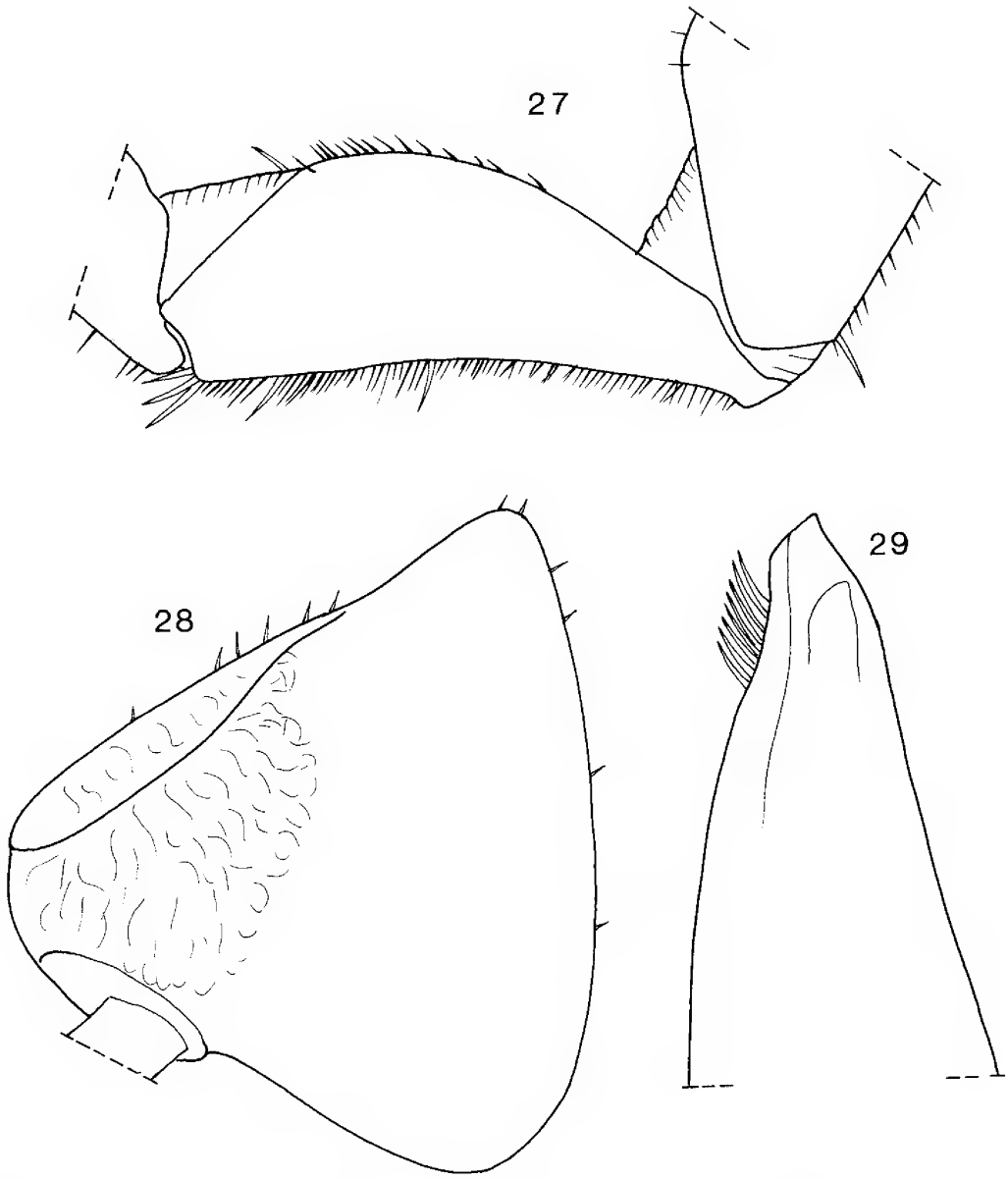


Fig. 26. *Parcylisticus georgianus* n. sp., ♂, holotype, 12.5 mm long (ZMM), telson and uropods in situ.



Figs. 27–29. *Parcylisticus georgianus* n. sp., ♂, holotype, 12.5 mm long (ZMM). – **27**. Ischium VII. **28**. Pleopod-exopodite I. **29**. Apex of pleopod-endopodite I.

3.2.3 *Parcylisticus golovatchi* **n. sp.**
(Figs. 30–36 and map Fig. 37)

Material examined

Holotype: ♂, 12.5 × 5.2 mm, SE-Armenia, Kafan District, Shikahoh Reserve, village Shikahoh, 900–950 m, *Quercus*, *Fagus*, *Carpinus* forest by spring, litter, logs and under stones, leg. GOLOVATCH, 28.IV.1983 (ZMM).

Paratypes: 1 ♂, 2 ♀♀ without marsupium, same collecting data as holotype (1 ♀: ZMM, 1 ♂, 1 ♀: SMNS T483).

Distribution

The only sample known of this species is from southeastern Armenia. The species is possibly sympatric with *P. zangezuricus*, but may be ecologically separated (lower altitudes).

Diagnostic characters

Maximum dimensions: 16 × 6 mm.

Coloration: Greyish brown with two rows of usual light muscle-spots, a series of light spots at the bases of the pereion-epimera.

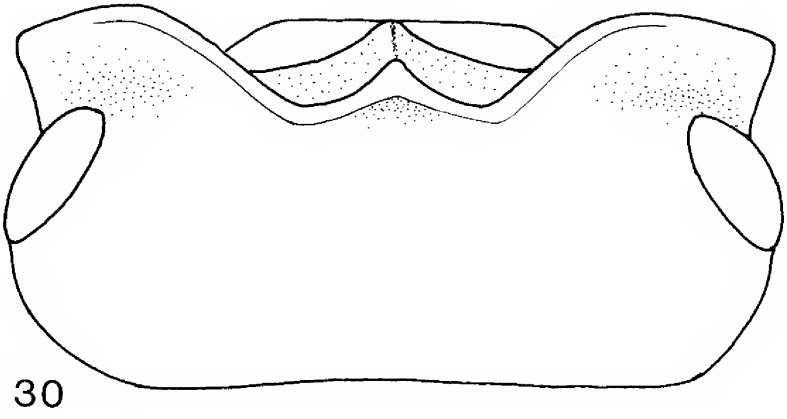
Cuticular characters: Tergal parts with very fine tuberculation.

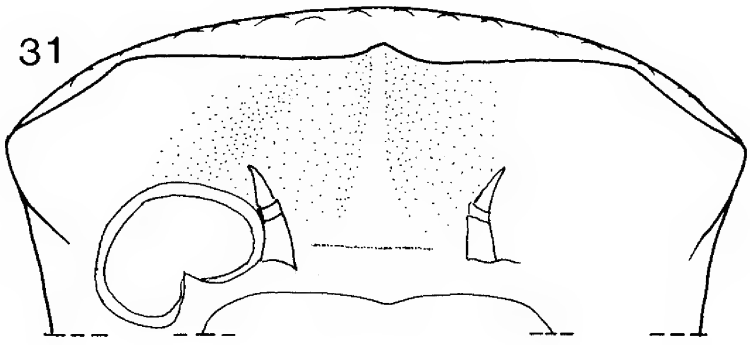
Head with quadrangular side-lobes, laterally forming slightly acute angles (Fig. 30). Median lobe not surpassing side-lobes, not standing upright and in frontal view not reaching outline of head (Fig. 31). Pereion-epimera I with posterior part reaching farther backwards than in *P. zangezuricus*, posterior angle rounded, not forming an acute angle (Fig. 32). Telson as long as basis wide, apex pointed (Fig. 33).

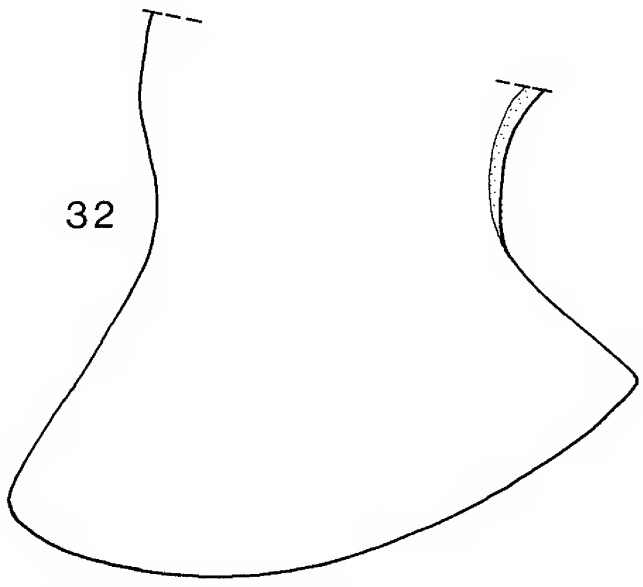
Male ischium VII ventrally slightly concave, with 3 or 4 median elongate spiny setae (Fig. 34) as it is usual in the members of *Cylisticus*, but in the other species of *Parcylisticus* there is only one of these elongate median setae. Ventrodistally the ischium bears a bundle of long spiny setae, as this is the rule in both genera. Male pleopod-exopodite I triangular, with slightly elongated hind-lobe whose apex is rounded (Fig. 35). Apex of endopodite I straight and with complex structures and row of spines (Fig. 36) as in all species of the genus.

Differential diagnosis

The species differs from its congeners by the median frontal lobe only slightly pointing upwards, the male pleopod-exopodite I with a short hind-lobe, and the male uropod-exopodites being considerably shorter than telson.







Figs. 30–32. *Parcylisticus golovatchi* n. sp., ♂, holotype, 12.5 mm long (ZMM). **30.** Head in dorsal view. **31.** Head in frontal view. **32.** Pereion-epimeron I.

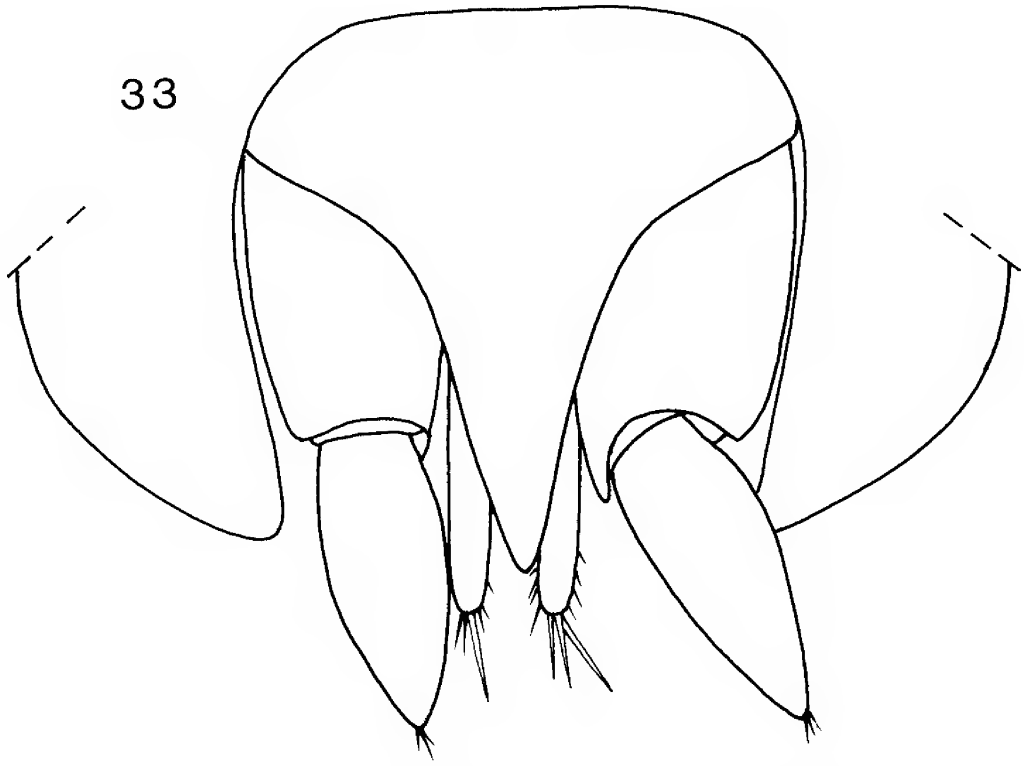
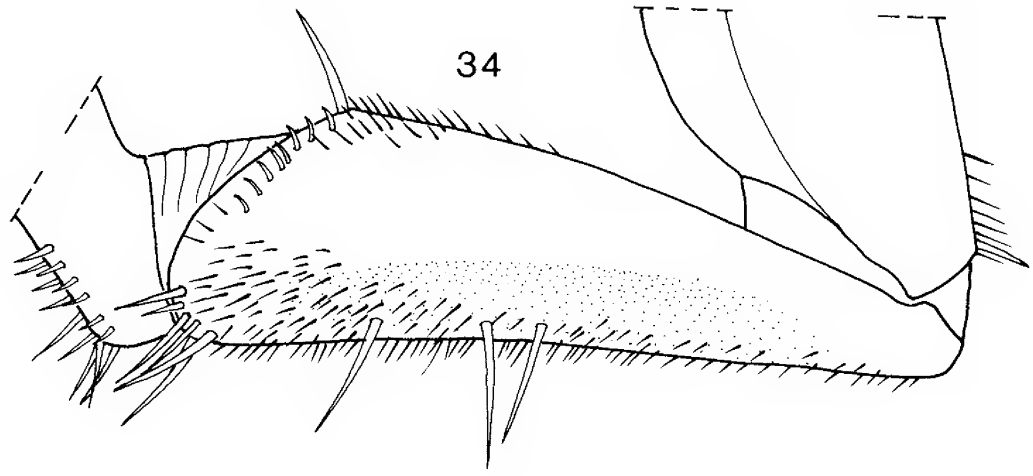
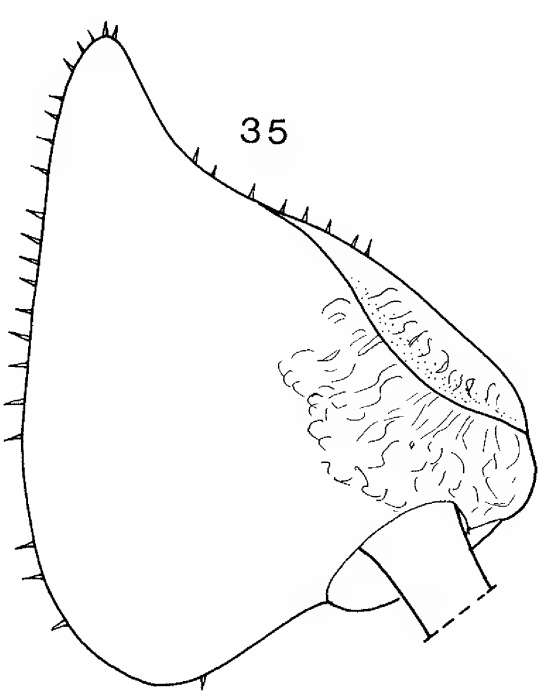
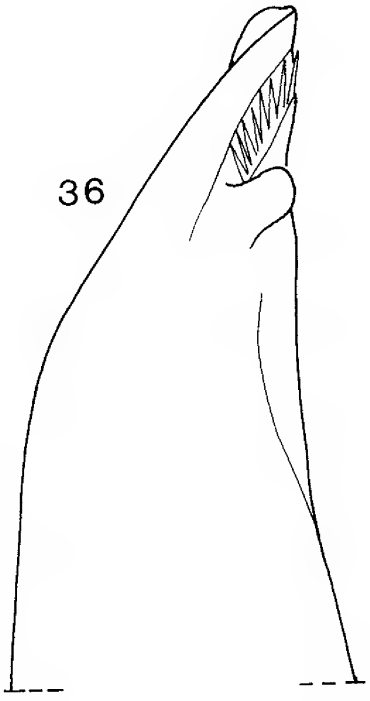


Fig. 33. *Parcylisticus golovatchi* n. sp., ♂, holotype, 12.5 mm long (ZMM), telson and uropods in situ.







Figs. 34–36. *Parcylisticus golovatchi* n. sp., ♂, holotype, 12.5 mm long (ZMM). – **34**. Ischium VII. **35**. Pleopod-exopodite I. **36**. Apex of pleopod-endopodite I.

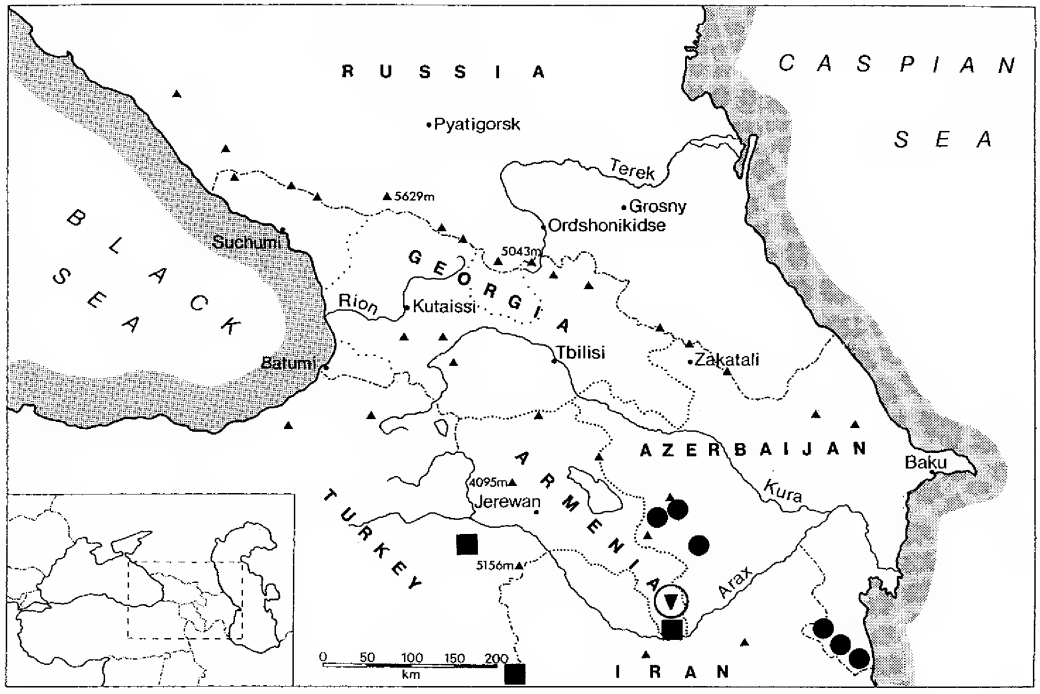


Fig. 37. Records of *Parcylisticus golovatchi* n. sp. (▼), *P. mrovdaghensis* (●) and *P. zangezuricus* (■).

3.2.4 *Parcylisticus mrovdaghensis* (Borutzky, 1970) (Figs. 38–44 and map Fig. 37)

Cylisticus (Parcylisticus) mrovdaghensis: Borutzky (1970: 38, figs. 1.3, 4.1–4.5).
Parcylisticus mrovdaghicus: Borutzky (1972b: 200).

Material examined

1 ♂, Azerbaijan, Mountainous Karabakh, a cave opposite Dashalty near Shusha, 1100 m, leg. Golovatch, 1.V.1983 (SMNS 13071). – 1 ♀, Azerbaijan, 15 km S of Shusha, 1700 m, *Quercus*, *Carpinus*, *Acer* etc. forest, litter, leg. Golovatch & Eskov, 3.VI.1987 (SMNS 13072). – 2 ♂♂, 2 ♀♀, Azerbaijan, southern side of Murovdag Mountains, 7 km N of Kelbadjar, 1450–1500 m, *Quercus*, *Carpinus*, *Acer* etc. forest, litter and under bark, leg. Golovatch & Eskov, 31.V.1987 (ZMM). – 5 ♀♀, Azerbaijan, Talish Mountains, Lerik District, Zuvand, Galabyn, 1700–2000 m, leg. Golovatch, 10.–11.X.1983 (ZMM). – 1 ♂, Azerbaijan, Lenkoran, Apo below Bilasar, 350 m, leg. Golovatch, 8.VI.1996 (ZMM). – 1 ♂, Azerbaijan, Yardymly, Avash, 1200–1500 m, leg. W. Schawaller, 14.–17.VI.1996 (SMNS 11538).

Further records

Southwestern Azerbaijan, Murovdag Mountains (type material, Borutzky 1970).

Distribution

Southern Azerbaijan. Known from two (disjunct?) areas: Murovdag Mountains in southwestern Azerbaijan and Lerik District in southeastern Azerbaijan (map Fig. 37).

Diagnostic characters

Dimensions: Biggest ♂ 10.0 × 3.7 mm, ♀ with marsupium from Murovdag Mountains 9.5 × 3.7 mm, ♀♀ from Lerik District much bigger, measuring 14 × 5.3 mm.

Coloration: Greyish brown with usual light muscle-spots, a medial light line on tergites, epimeral margins yellowish.

Cuticular structures: Tergal parts tuberculated.

Head with strongly protruding side-lobes whose lateral corners are pointed and form an acute angle (Fig. 38 shows head in dorsal view, while BORUTZKY 1970 and STROUHAL 1953 depict the heads in dorsocaudal views). Acutely pointed median lobe vertically pointing upwards and surpassing the outline of the head in frontal view (Fig. 39). Pereion-epimera I posteriorly concavely rounded, with acute posterior angle protruding far backwards, longer than in *P. georgianus* (Fig. 40); anterior angle turning upwards forming a concave groove along lateral margin. Inner margins of pleon-epimera V slightly convergent, telson slightly wider than long (Fig. 41).

Basipodite of male pereiopod VI medially with stronger setation than in pereiopod V, otherwise no sexual modifications. Male ischium VII with ventral margin nearly straight and setose, but with only one longer seta in the middle (Fig. 42) as in *P. georgianus* and two long spiny setae mediodistally. Male pleopod-exopodite I with a small pointed hind-lobe (Fig. 43), apex of endopodite I see Fig. 44. Uropod-exopodites in males and females very flat and rounded also on inner side (Fig. 41), in males about one third bigger than in females.

Differential diagnosis

The species differs from other members of the genus by a frontal median lobe steeply pointing upwards, a male pleopod-exopodite I with a short but distinctive hind-lobe and by uropod-exopodites in both sexes about as long as telson and conspicuously flat and rounded.

3.2.5 *Parcylisticus zangezuricus* (Borutzky, 1970) (Figs. 45–53 and map Fig. 37)

Cylisticus (Parcylisticus) zangezuricus: BORUTZKY (1970: 37, figs. 1.2, 3.1–3.5).
Parcylisticus zangezuricus: BORUTZKY (1972b: 200).

Material examined

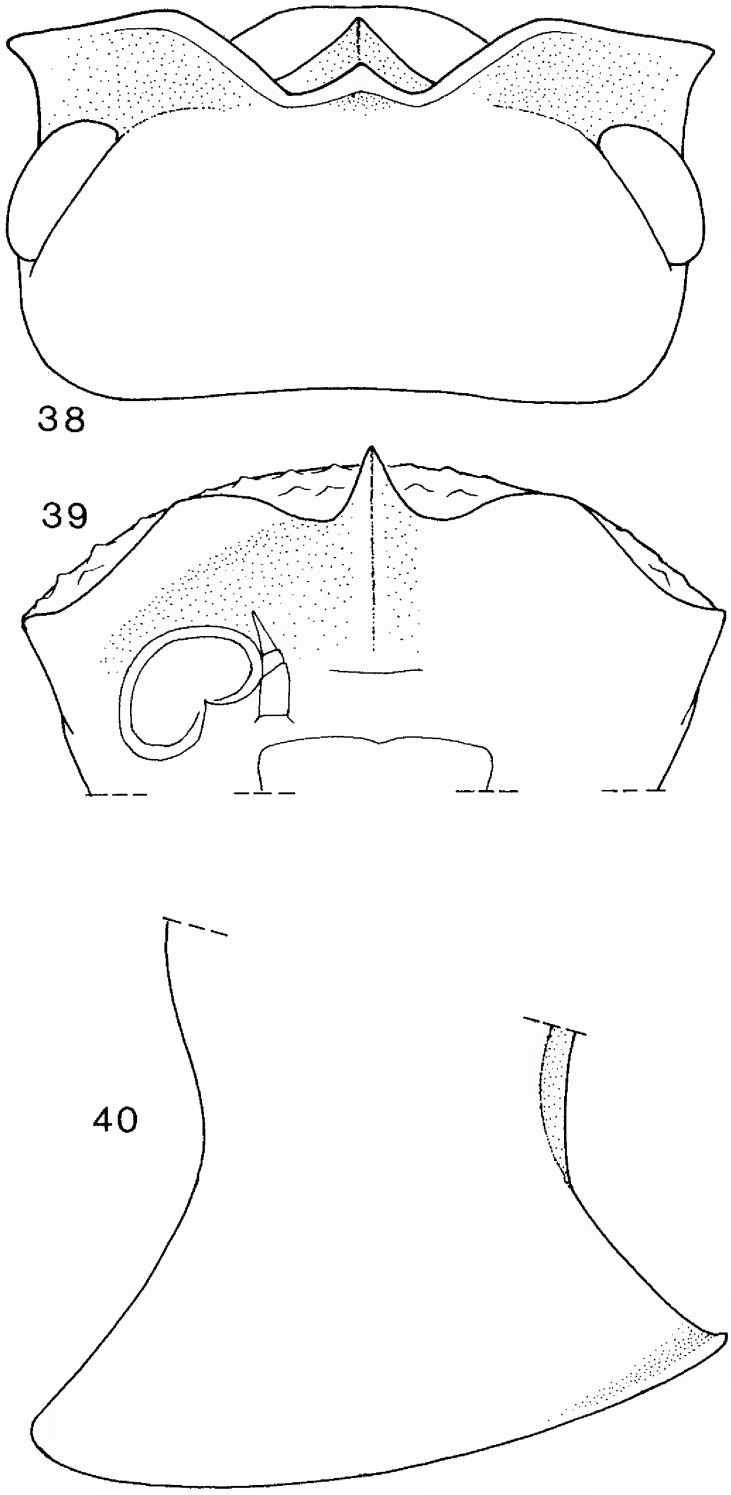
56 specimens, eastern Turkey, Lake Balik 60 km E Adri, ± 2400 m, leg. SCHMALFUSS, 10.VI.1986 (SMNS 11500). – Doubtful: 4 juv., eastern Turkey, pass 70 km SE Van (road to Hakkari), 2500 m, leg. SCHMALFUSS, 6.VI.1986 (SMNS 11502).

Further records

Southeastern corner of Armenia, Zangezur Mountains, surroundings of Megri (types, BORUTZKY 1970).

Distribution

If the ascription of the new material to *P. zangezuricus* is correct, the species is known from eastern Turkey (from the Ararat region in the north to the Hakkari Mountains in the south) and from southeastern Armenia, suggesting its occurrence also in northwestern Iran.



Figs. 38–40. *Parcylisticus mrovdaghensis*, ♂, 10 mm long, near Shusha (SMNS 13071). – **38.** Head in dorsal view. **39.** Head in frontal view. **40.** Pereion-epimeron I.

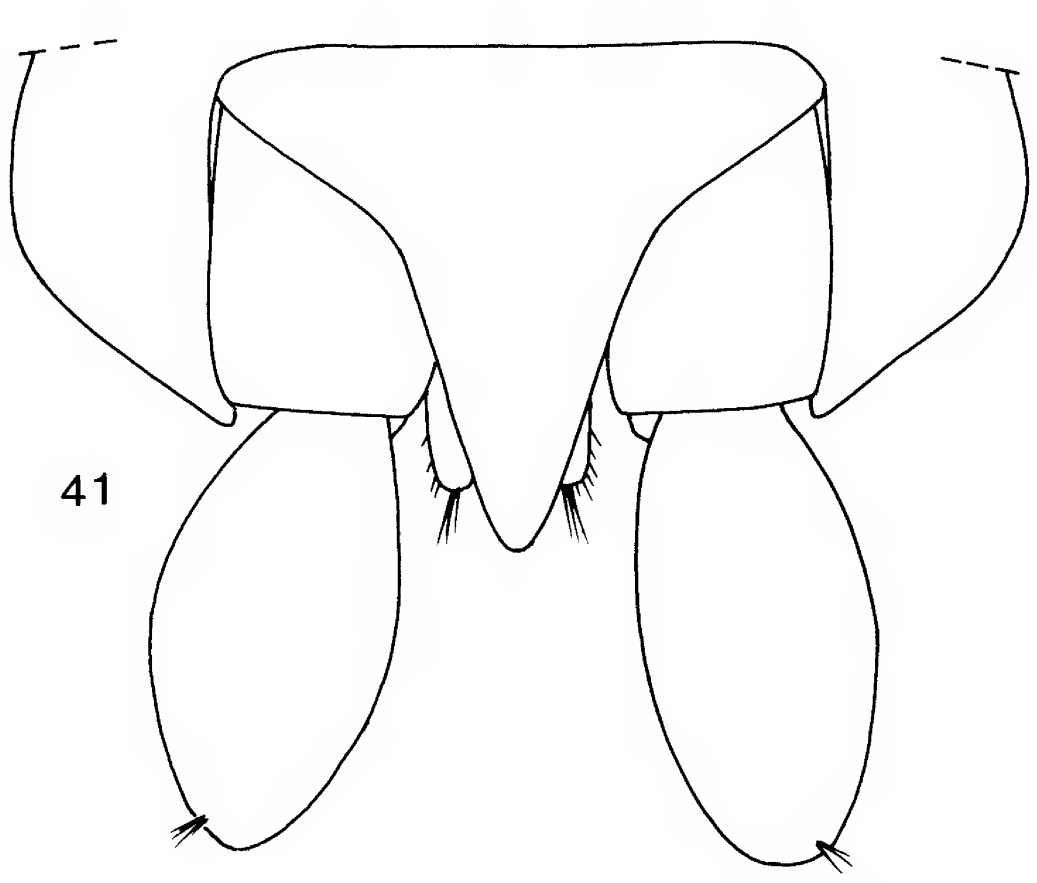
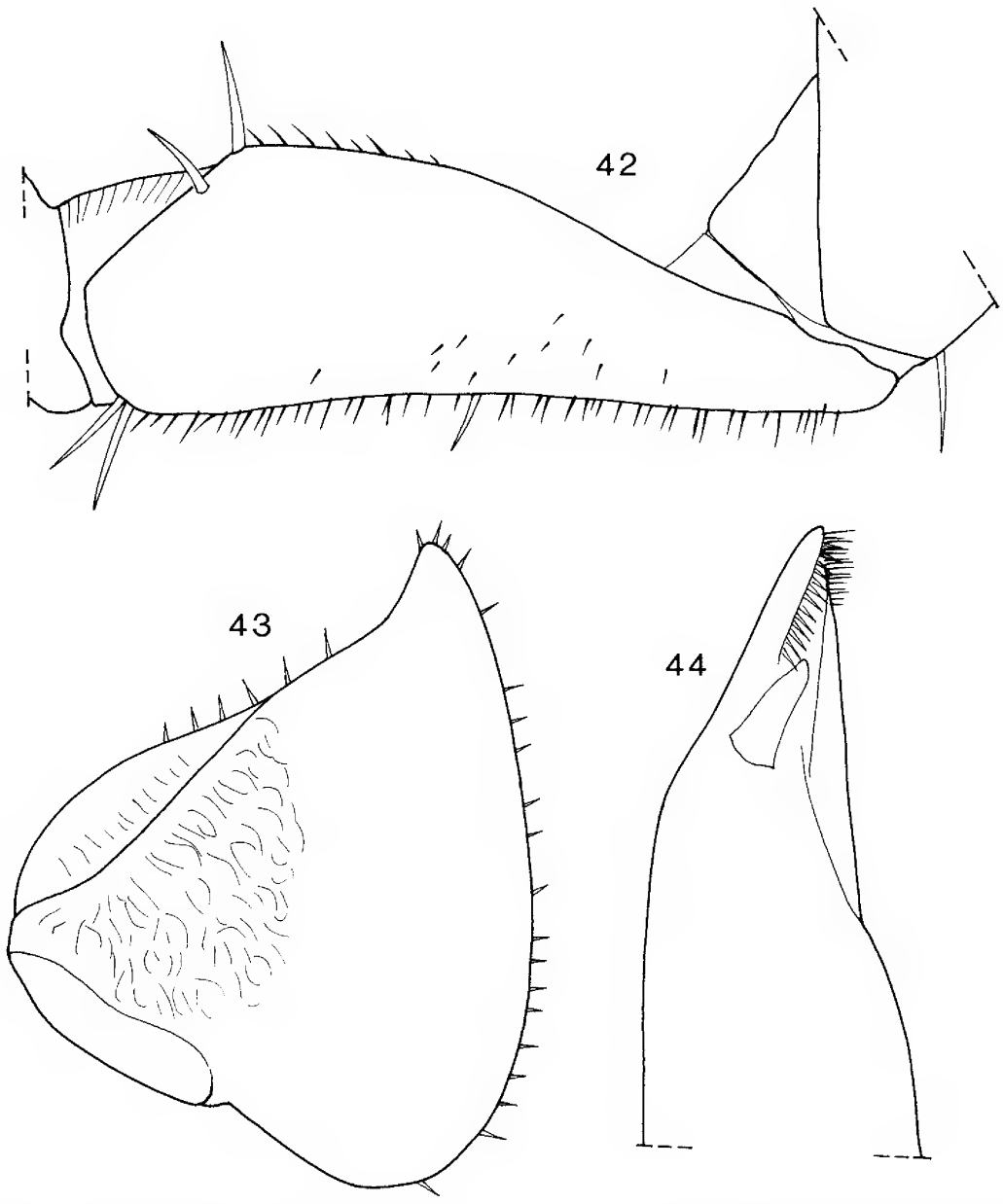


Fig. 41. *Parcylisticus mrovdaghensis*, ♂, 10 mm long, near Shusha (SMNS 13071), telson and uropods in situ.



Figs. 42–44. *Parcylisticus mrovdaghensis*, ♂, 10 mm long, near Shusha (SMNS 13071). – **42**. Ischium VII. **43**. Pleopod-exopodite I. **44**. Apex of pleopod-endopodite I.

Diagnostic characters

Dimensions: ♂ with maximum length 10 mm, ♀ with maximum length 12 mm; smallest ♀ with marsupium 10 mm.

Coloration: Greyish brown with usual light muscle spots, margins of epimera light.

Head with strongly protruding side-lobes with lateral corner not protruding and forming a right angle (Fig. 45). Acutely pointed median lobe vertically pointing upwards and surpassing the outline of the head considerably in direct frontal view (Fig. 46), as in *P. mrovdaghensis*. Pereion-epimera I posteriorly concave and rounded, the hind angle not as acute as in *georgianus* and *mrovdaghensis* (Fig. 47). Inner margins of pleon-epimera V slightly convergent, telson seems to be longer in males (Figs. 48–49).

Basipodite of male pereiopod VI without sexual modifications (Fig. 50) and not different from basipodite V. Ischium VII ventrally concave, with one tactile seta in the middle and two mediodistally (Fig. 51). Male pleopod-exopodite I with rounded hind-lobe which is longer than in *georgianus* and *mrovdaghensis* but much shorter than in the typical *pugionifer* (compare STROUHAL 1953, fig. 26), laterally concave (Fig. 52), apex of endopodite I see Fig. 53. Male uropod-exopodites flattened and widened, shorter than telson (Fig. 48), in the typical *pugionifer* much longer than telson (see STROUHAL 1953, fig. 23). Female uropod-exopodites much smaller than in male (Fig. 49).

Differential diagnosis

The species differs from other congeners by a frontal median lobe steeply pointing upwards, male pleopod-exopodite I with pronounced hind-lobe and sexually dimorphic uropod-exopodites, in male as long as telson, in female only half as long.

4 *Cylisticoides* n. gen.

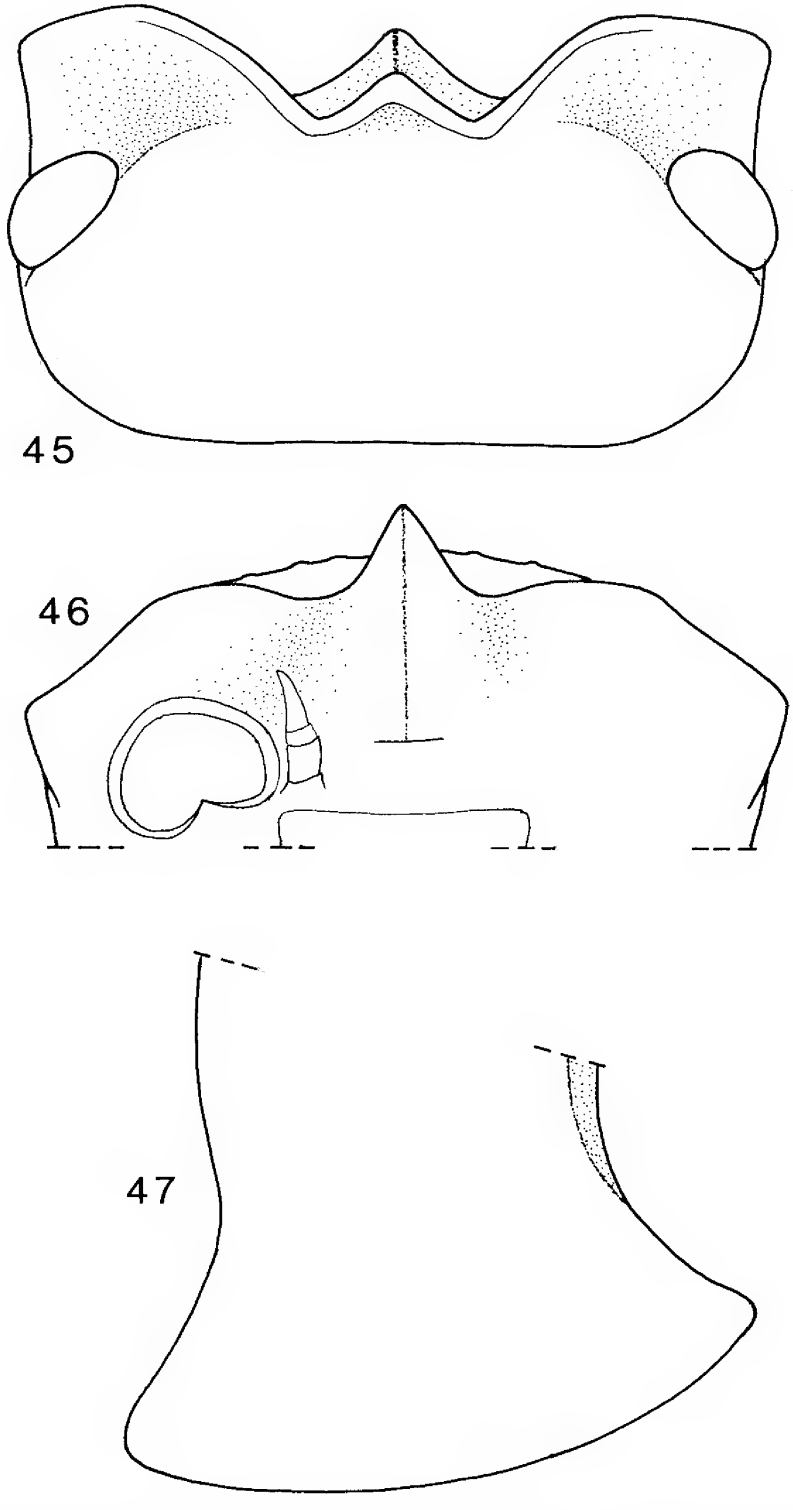
4.1 Diagnose of the genus

Type-species: *Cylisticoides angulatus* n. sp.

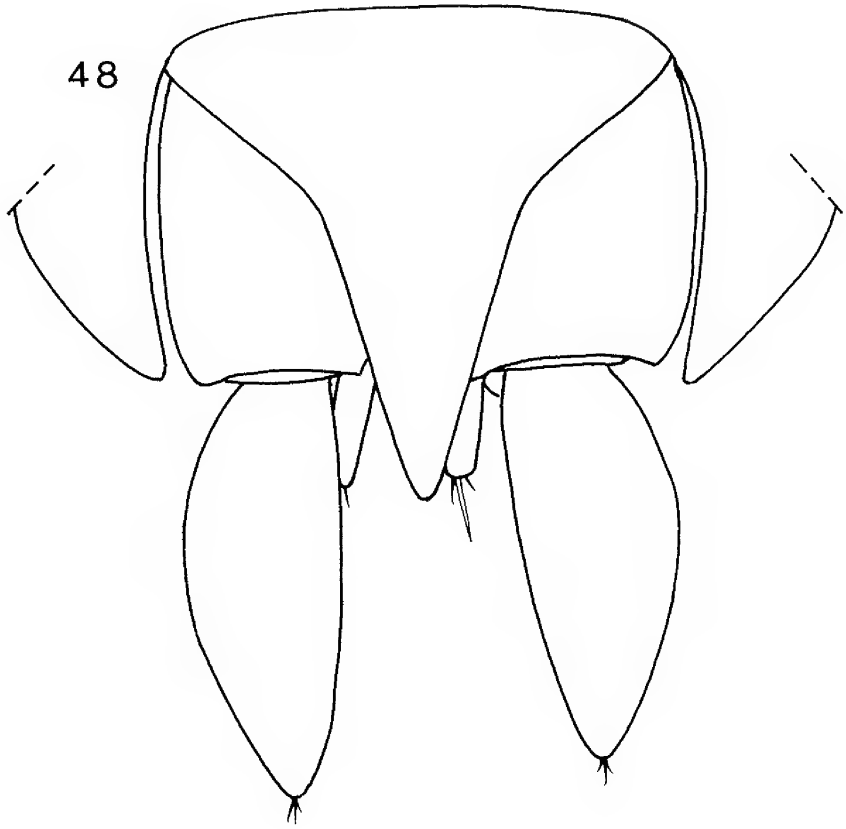
A second species considered to belong to the new genus is *Cylisticus rotundifrons* Schmalfuss, 1986 (see SCHMALFUSS 1986a: 394, figs. 58–62) from northern Iran, province Masandaran.

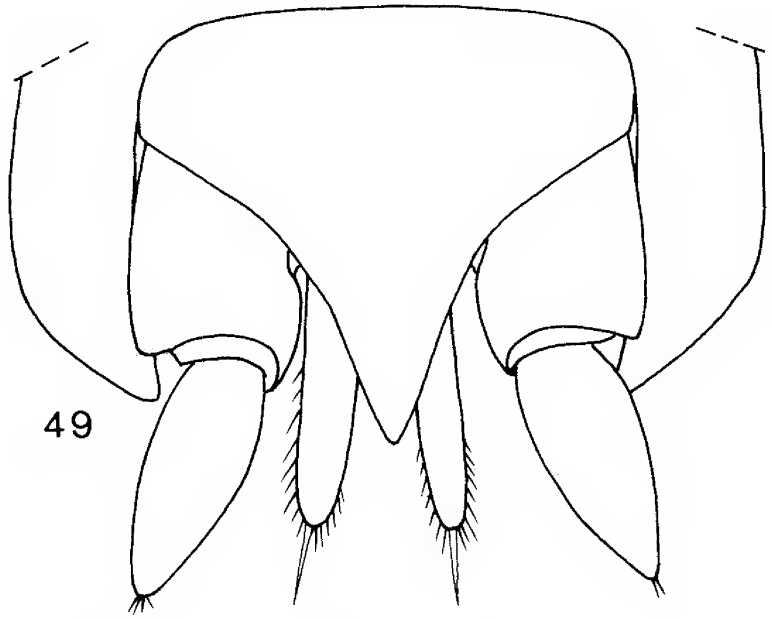
Diagnostic characters

- Animals capable of euspheric conglobation (cross-section of tergites form a semi-circle).
- Antennae outside the rolled-up animal (exoantennal).
- Head with well-developed rounded median lobe and quadrangular side-lobes.
- Noduli laterales IV and VII not eccentric as in *Cylisticus* (compare Fig. 6) and *Parcylisticus*, on tergites II-VII about the same distance from the lateral margin.
- Male pereiopod VI without any sexual modifications.

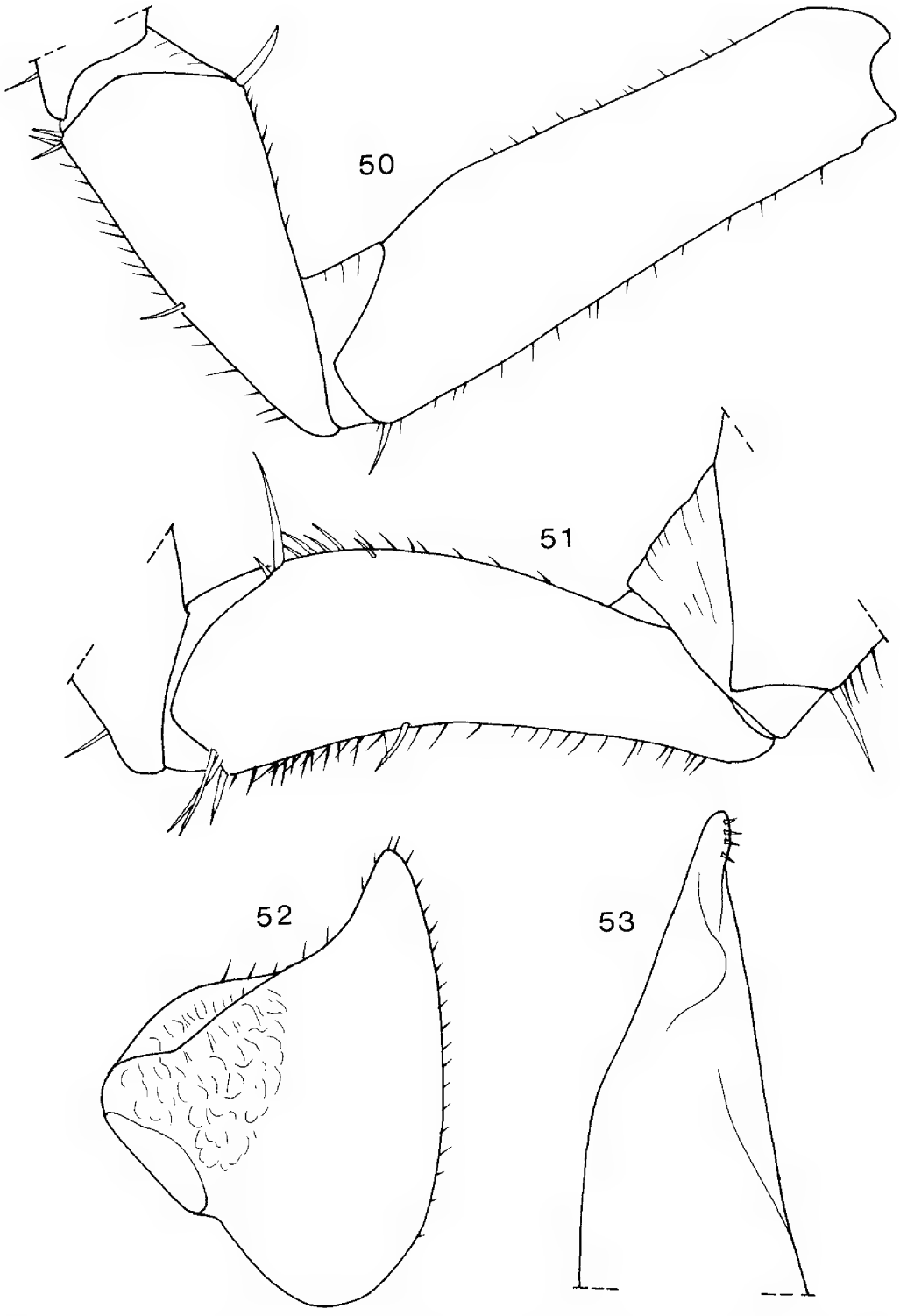


Figs. 45–47. *Parcylisticus zangezuricus*, ♂, 9.5 mm long, Lake Balik (SMNS 11500). – **45**. Head in dorsal view. **46**. Head in frontal view. **47**. Pereion-epimeron I.





Figs. 48–49. *Parcylisticus zangezuricus*. – **48**. ♂, 9.5 mm long, Lake Balik (SMNS 11500), telson and uropods in situ. **49**. ♀ without marsupium, 12 mm long, Lake Balik (SMNS 11500), telson and uropods in situ.



Figs. 50–53. *Parcylisticus zangezuricus*, ♂, 9.5 mm long, Lake Balik (SMNS 11500). – **50.** Basipodite and ischium of pereiopod VI (no sexual modifications). **51.** Ischium VII. **52.** Pleopod-exopodite I. **53.** Apex of pleopod-endopodite I.

- Male pereiopod VII with pronounced sexual modifications, but ventrally only with one long spine (not with multiple long spines as in *Cylisticus* and *Parcylisticus*).
- All five pleopod-exopodites possess well-developed lungs with multiple openings as in *Cylisticus*.
- Uropod-exopodites shortened, hardly surpassing the telson.

Differential diagnosis

The new genus differs from *Cylisticus* and *Parcylisticus* by a different head morphology (median lobe broadly rounded), the noduli laterales IV and VII not eccentric, extremely shortened uropod-exopodites hardly surpassing the apex of the telson and strong male sexual specializations on pereiopod VII including ischium, merus and carpus. Its similarity to *Cylisticus* and related genera is due to its conglobation ability which may have developed independently. For the time being no doubtless synapomorphies of the two genera can be defined, so the new genus may not be closely related to *Cylisticus*.

4.2 *Cylisticoides angulatus* **n. sp.**
(Figs. 54–66 and map Fig. 67)

? *Cylisticus* sp. II: SCHMALFUSS (1986a: 394, fig. 63).

Material examined

Holotype: ♂, 6.0 × 2.1 mm, SE-Azerbaijan, Astara District, Istisu W of Astara, forest, leg. H. ALIEV, 27.IV.1984 (ZMM).

Paratypes: 1 ♂, collecting data as holotype (SMNS T484). – 1 ♀ with marsupium, SE-Azerbaijan, Lenkoran district, Azfilia, 100 m, leg. W. SCHAWALLER, 31.V.1996 (SMNS T508). – 1 ♂, 1 ♀, SE-Azerbaijan, Lenkoran district, Apo below Bilasar, 350 m, leg. S. GOLOVATCH & W. SCHAWALLER, 8.VI.1996 (ZMM, SMNS T511). – 4 ♂♂, 2 ♀♀ without marsupium, SE-Azerbaijan, Lenkoran district, Hyrcan Nature Reserve, Alekseevka, 50 m, *Quercus*, *Parrotia*, *Carpinus* etc., litter, rotten wood, leg. S. GOLOVATCH, 13.X.1983 (ZMM). – 2 ♂♂, 2 ♀♀ with marsupium, 1 ♀ without marsupium, SE-Azerbaijan, Masally, Istisu W Masally, 300 m, leg. S. GOLOVATCH & W. SCHAWALLER, 18.VI.1996 (SMNS T509). – 1 ♀ without marsupium, SE-Azerbaijan, Yardymly, Avash, 1200–1500 m, leg. S. GOLOVATCH, 4.–17.VI.1996 (ZMM). – 2 ♂♂, 3 ♀♀ with marsupium, 1 ♀ without marsupium, SE-Azerbaijan, Astara district, Istisu W Astara, 100 m, leg. S. GOLOVATCH, 2.–6.VI.1996 (ZMM, SMNS T510).

Specimens doubtfully belonging to this species (so not to be considered as types) are: 1 ♀ without marsupium, 9.0 × 3.2 mm, Russia, Krasnodar Territory, Sochi, Dagomys, 250 m, shrub, *Quercus*, *Carpinus*, *Fagus* etc., litter, logs, leg. GOLOVATCH, 18.V.1983 (ZMM). – 1 ♀ without marsupium, 9.0 × 3.2 mm, N-Iran, Masandaran, Elburs Mountains, Dasht-Nazir, 1000–1300 m, degraded forest, leg. J. MARTENS & H. PIEPER, 26.V.1978 (SMF, published by SCHMALFUSS 1986a: 394, fig. 63, as *Cylisticus* sp. II). – These two females are very similar to the types of *C. angulatus*, but only males from the collecting localities will prove them to belong to the same or to a different species, which would be likely also for geographical and ecological reasons.

Distribution

For sure the species is known from southeastern Azerbaijan (map Fig. 67); see also additional doubtful specimens under material examined.

Diagnostic characters

Maximum dimensions: 7.5 × 2.8 mm, smallest ♀ with marsupium 5 mm long.

Coloration: Light greyish violet. In two specimens the telson and the uropods are without pigmentation.

Cuticular structures: Tergites completely smooth.

Head with a well-developed rounded median lobe and quadrangular side-lobes (Figs. 54–55). Pereion-epimeron I with angular concavity on back margin and with a ledge along side margin (Fig. 56). Interestingly, the latter structure is also present in *Schizidium davidi*, another conglobating species from a different family, which lives in the same area (SCHMALFUSS 1988: 17, fig. 46, SCHMALFUSS 1990: 8). The function could be an optimization of the effectiveness of conglobation, directed against specific predators. The medial margins of the pleon-epimera V are converging (Fig. 57). Telson with concave sides and a bluntly pointed apex (Fig. 57). Antennal flagellum with distal joint three times as long as proximal one (Figs. 58–59).

Male pereiopods I-IV with setal brushes on carpus and merus. Male pereiopod VI without sexual modifications (Fig. 60), male pereiopod VII with ischium „humpbacked" and ventrally slightly concave, merus with a process which bears a brush of very short hair, and carpus club-like with swollen distal end (Fig. 61). Male pleopod-exopodite I triangular with rounded hind-lobe (Fig. 62), endopodite I straight, apex with a lobe-like extension (Figs. 63–64). Male pleopod II see Figs. 65–66. Uropod-exopodite very short, hardly surpassing the tip of the telson (Fig. 57), so the abdomen has a continuous outline (adaptation to conglobation).

Differential diagnosis

C. angulatus n. sp. differs from *C. rotundifrons* (Schmalfuss, 1986) by the angled hind margin of pereion-epimeron I (rounded in *rotundifrons*) and by the presence of a ridge on the lateral margin of epimeron I (lacking in *rotundifrons*).

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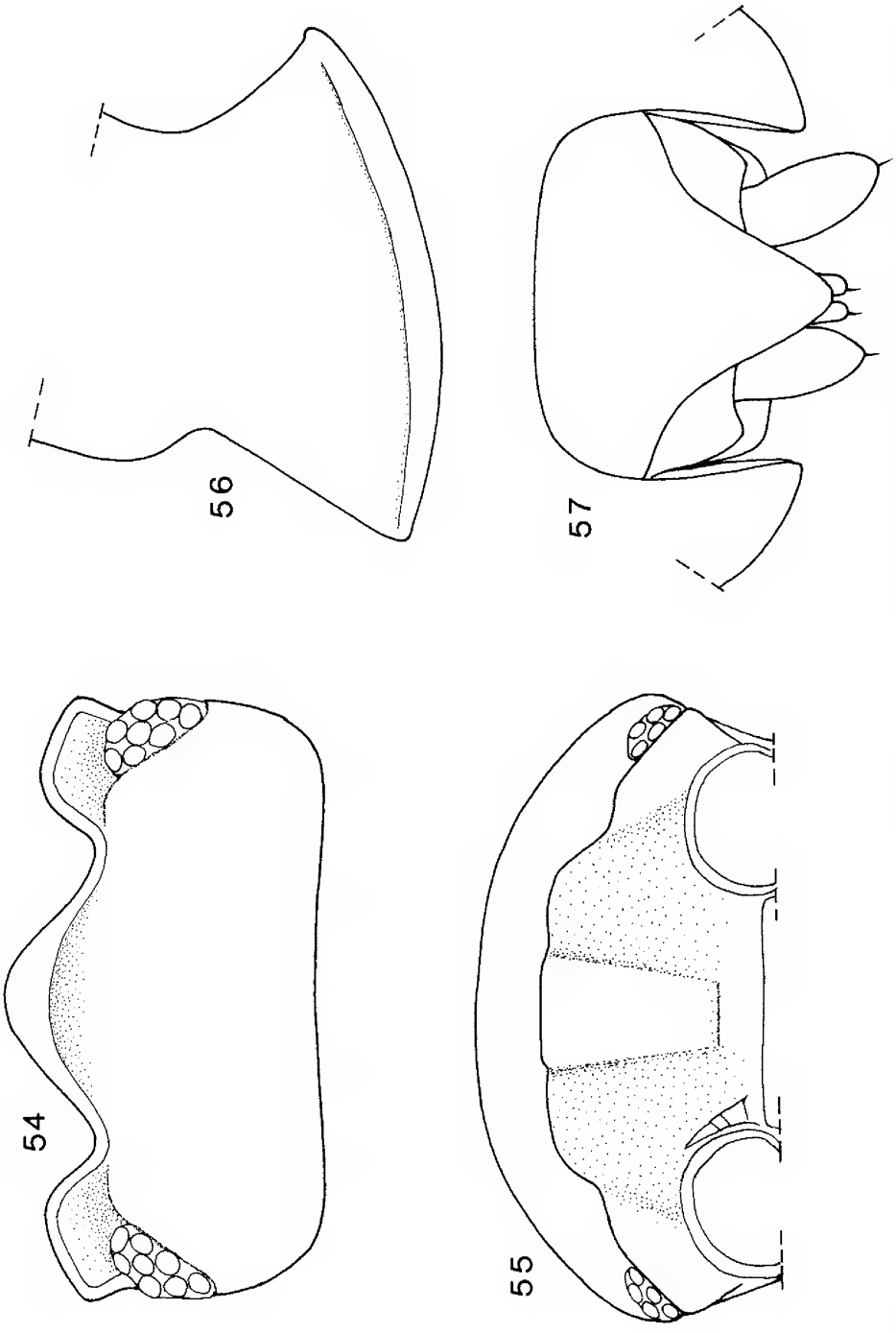
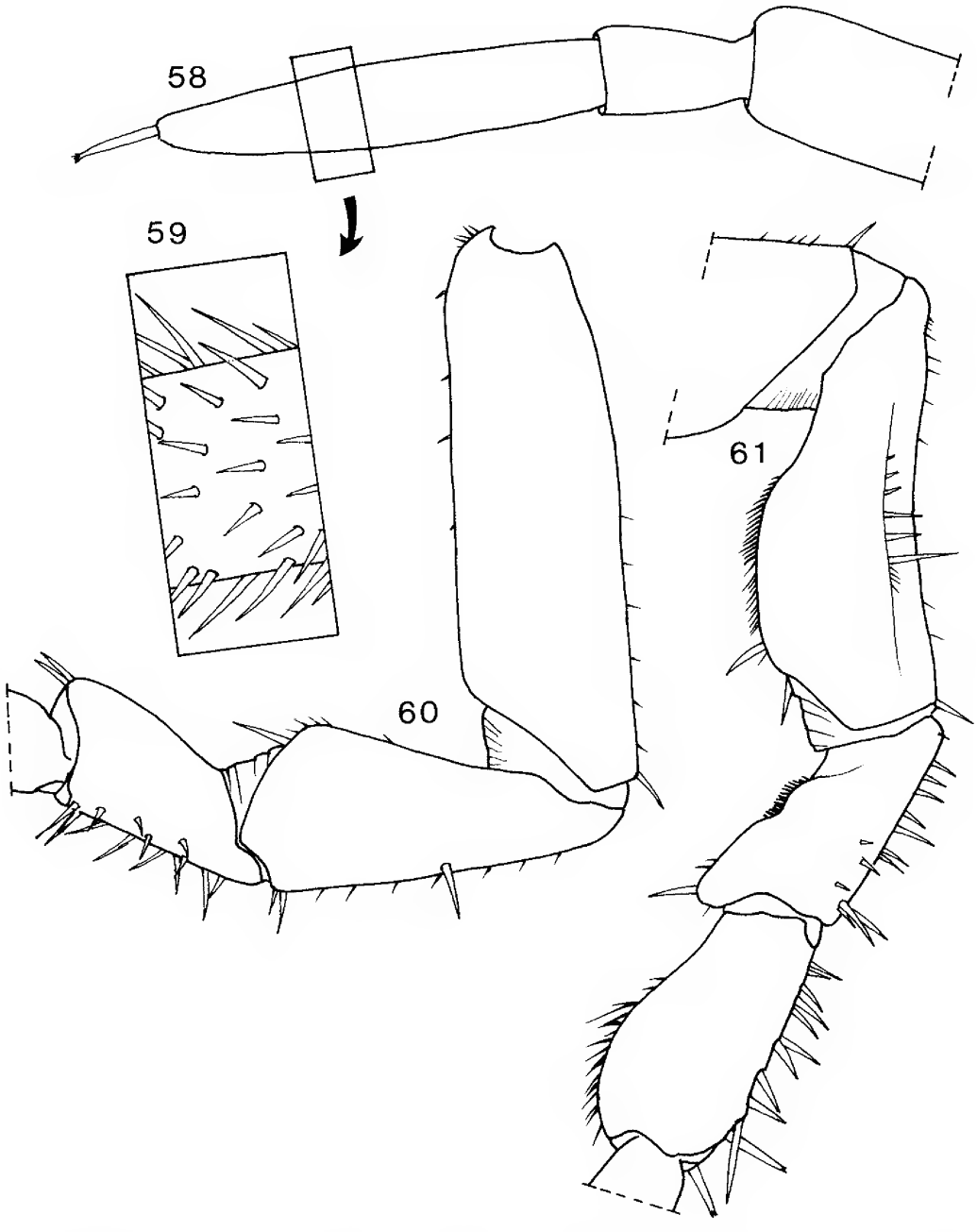
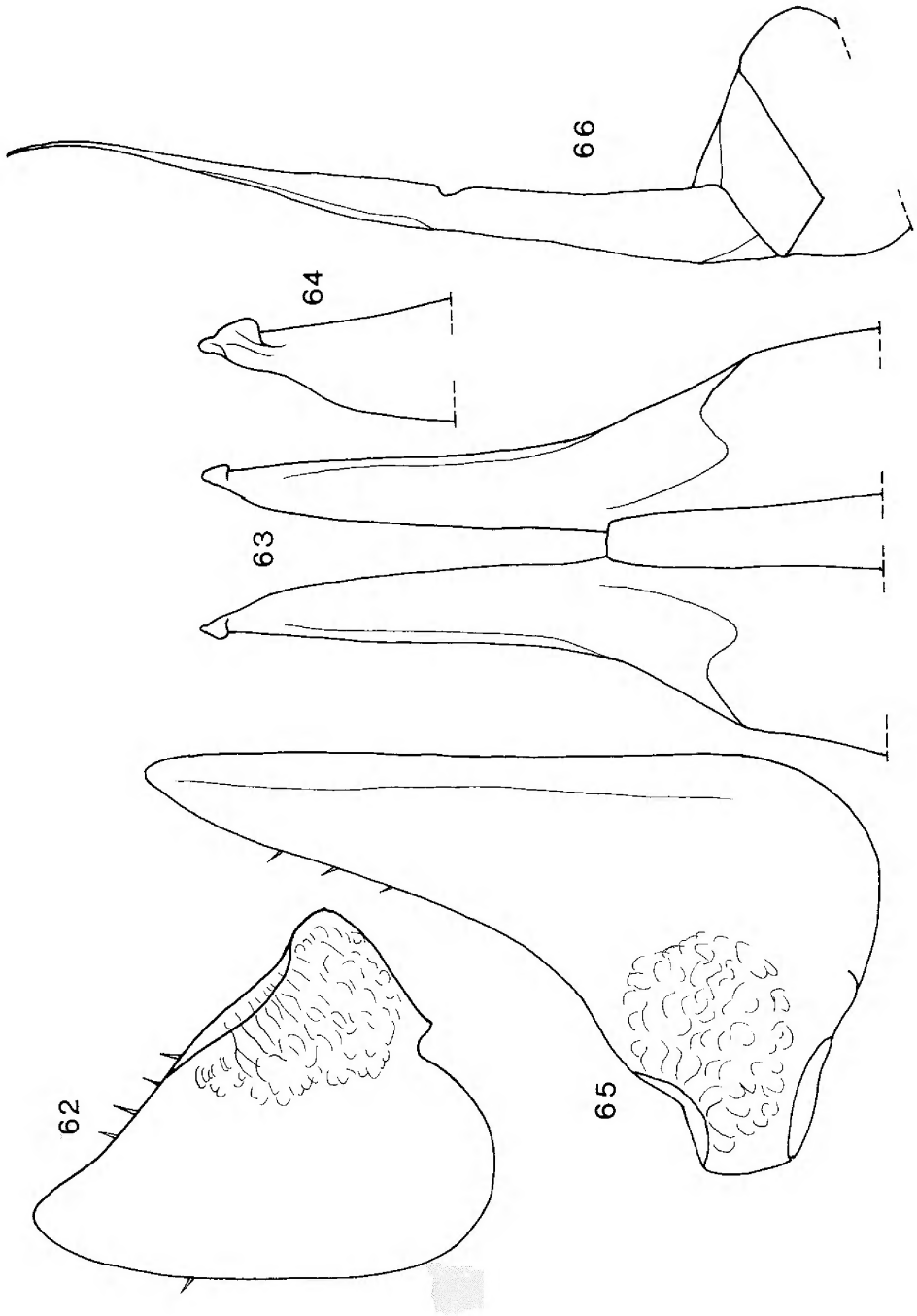


Figs. 54–57. *Cylisticoides angulatus* n. gen. n. sp., ♂, holotype, 6.0 mm long (ZMM). – **54**. Head in dorsal view. **55**. Head in frontal view. **56**. Pereion-epimeron I. **57**. Telson and uropods in situ.



Figs. 58–61. *Cylisticoides angulatus* n. gen. n. sp., ♂, holotype, 6.0 mm long (ZMM). – **58**. Flagellum of antenna. **59**. Enlarged part of distal flagellar joint to show setation. **60**. Pereiopod VI (no sexual modifications). **61**. Pereiopod VII.



Figs. 62–66. *Cylisticoides angulatus* n. gen. n. sp., ♂, holotype, 6.0 mm (ZMM). – **62.** Pleopod-exopodite I. **63.** Pleopod-endopodites I. **64.** Apex of pleopod-endopodite I. – **65.** Pleopod-exopodite II. **66.** Pleopod-endopodite II.

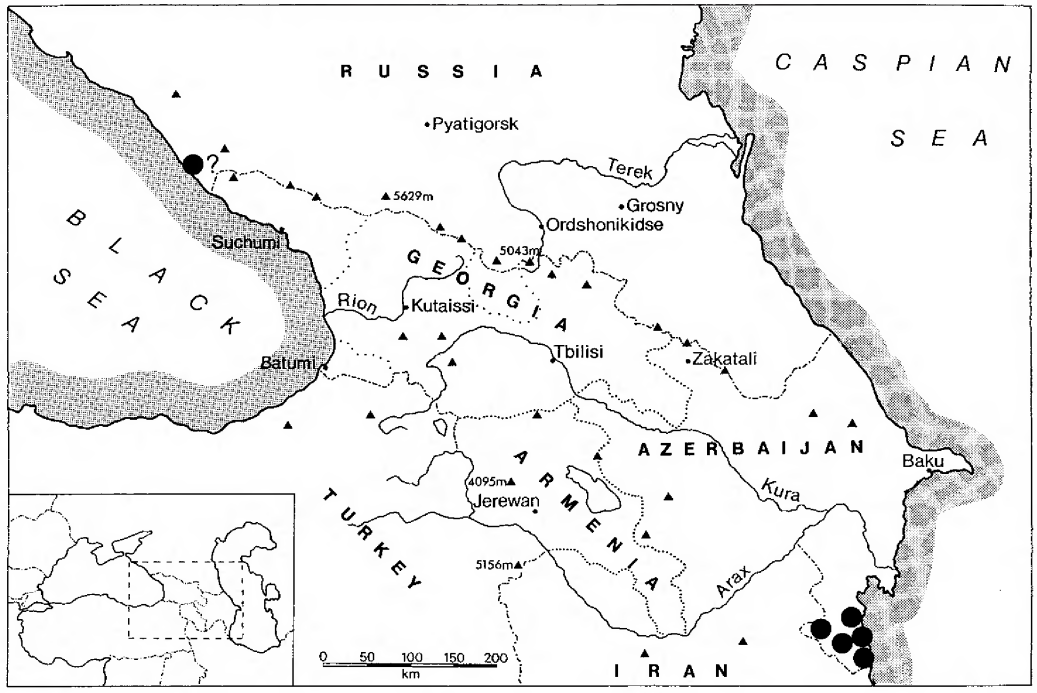


Fig. 67. Records of *Cylisticoides angulatus* n. gen. n. sp. (●). The record from the northeastern coast of the Black Sea is a female and may be a different species.

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